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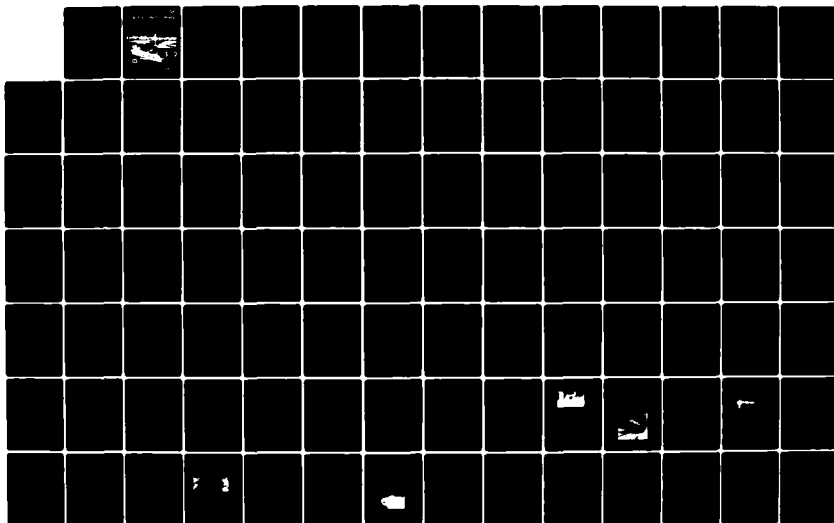
BUFFALO HARBOR STUDY PRELIMINARY FEASIBILITY REPORT
VOLUME I MAIN REPORT(U) CORPS OF ENGINEERS BUFFALO NY
BUFFALO DISTRICT APR 83

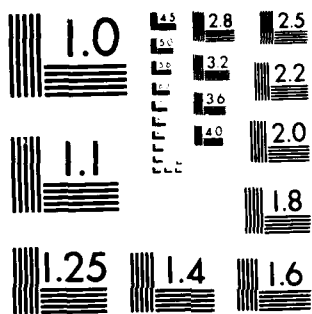
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Buffalo Harbor Study

Preliminary Feasibility Report

Volume I

Main Report



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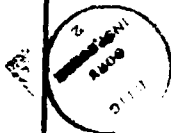
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Buffalo Harbor Study, which began in December 1979, is a six-year planning effort that is being conducted by the Buffalo District Corps of Engineers. The purpose of the study is to determine the feasibility of making commercial navigation improvements to the harbor so that industries which depend on water transportation in Buffalo can operate more efficiently in the future. Thus far, in the study, four categories of improvements have been considered: (1) Realizing the Buffalo River; (2) deepening the Buffalo River for 700-foot		

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vessels; (3) transshipment of raw materials upriver and (4) improvements to the South Entrance Channel. The Reconnaissance Report, which is the predecessor of the Preliminary Feasibility Report (PFR), concluded that realizing the Buffalo River was not economically feasible. The conclusion of the PFR is that deepening of the Buffalo River for 700-foot vessels is also not feasible. The final Corps recommendations to Congress regarding commercial navigation and a couple of other supplementary investigations will appear in the Final Feasibility Reports scheduled for completion in September 1986.

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ADDENDUM TO THE BUFFALO HARBOR STUDY
PRELIMINARY FEASIBILITY REPORT

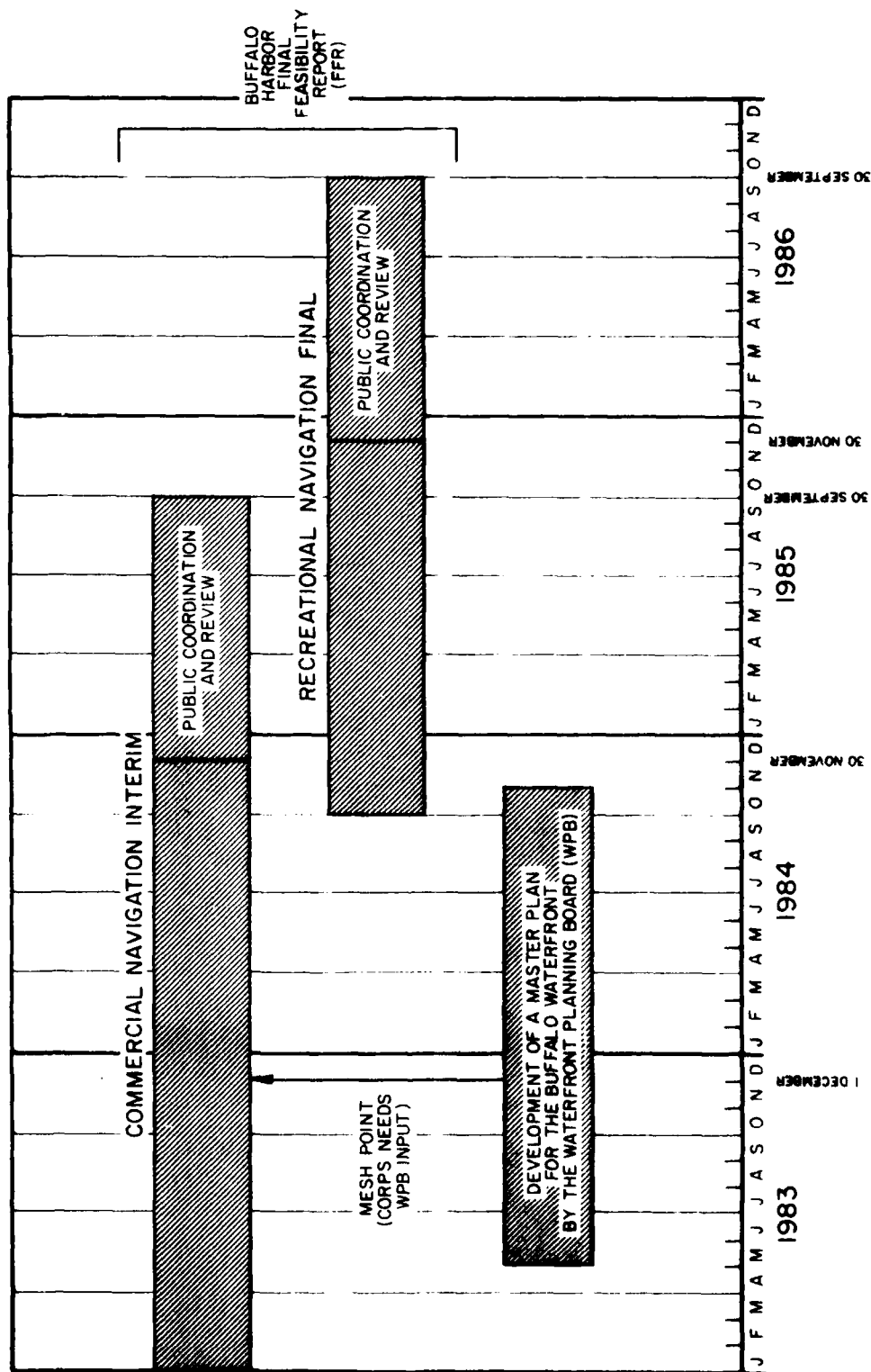
The Corps' multiobjective planning process as it pertains to the Buffalo Harbor Study, will result in three reports being prepared over the duration of the study. The first two, the Reconnaissance Report and the Preliminary Feasibility Report (PFR), are actually stepping stones to the third and final report, which is the Final Feasibility Report (FFR). This is the document that will be sent to Congress in response to its authorizing legislation. The recommendations in the FFR will serve as the basis for any future Congressional action.

At the time of this writing, the announcement of a possible large scale reduction in operations by Bethlehem Steel at its Lackawanna facility has been given considerable coverage in both the local and national media. This action, should it be implemented, coupled with the indefinite suspension of operations at Republic Steel and the shutdown at the Hanna Furnace Company, would certainly have a dramatic short-term impact, not to mention long-term effects. However, since the PFR was researched and completed well in advance of these events, it would not be prudent to redo the mass of work in an attempt to anticipate consequences which may result from scenarios which are as yet uncertain. If, in fact, the worst case materializes, i.e., curtailments and suspensions continue or become permanent shutdowns, they will be incorporated into the FFR.

Two additional events which also could not be addressed by the PFR are the September 1982 passage of an additional Congressional Resolution sponsored by Congressman Henry J. Nowak, regarding the Buffalo Harbor Study and an October 1982 request by local interests to delay the study. The new Congressional Resolution expanded the study area to include the Niagara River shoreline of the city of Buffalo and requested that specific consideration be given to recreational navigation. The request to delay the study by local interests was based on the need to coordinate the efforts of this study with those of a master planning effort now underway for the waterfront of the city of Buffalo. The impact of the new Congressional Resolution is that the FFR will be completed in two parts: an interim commercial navigation report and a final report which concentrates on recreation. A pictorial presentation of this is shown on the next page of this addendum.

The top bar of the diagram represents the commercial navigation interim. This document will require significant input from the master planning effort now underway for the Buffalo waterfront by the Waterfront Planning Board Study which is shown by the third bar. The commercial navigation interim will complete the examination of the commercial navigation needs of Buffalo Harbor and the expanded study area. The second bar is part two of the FFR. It is the recreational navigation investigation. It will review the recreational navigation problems associated with the same geographic area as the commercial navigation interim and provide specific recommendations.

SEQUENCE OF EVENTS ASSOCIATED WITH THE FORMULATION OF THE BUFFALO HARBOR 2 PART FINAL FEASIBILITY REPORT



Once this is done, the Buffalo Harbor Feasibility Study will be complete. The key dates associated with this process are as follows:

1 December 1983 - Corps needs input from the Waterfront Planning Board regarding the port-related portion of the masterplan for the Buffalo waterfront.

30 November 1984 - Draft Commercial Navigation Interim is completed.

30 November 1985 - Draft Recreational Navigation Report is completed.

30 September 1986 - Buffalo Harbor Feasibility Study is completed.

The emphasis from a commercial navigation standpoint during the development of the FFR will be to try to make a final determination as to the longterm outlook for the port and develop the kinds of recommendations which will be most compatible with this scenario. Depending on what that outlook indicates, the Buffalo District may refine the alternatives already developed, search for new ones or simply decide that no harbor improvements are needed in the foreseeable future.

BUFFALO HARBOR, NY
STAGE 2 REPORT

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ACKNOWLEDGMENTS

This Stage 2 Report was prepared through the efforts of many individuals on the interdisciplinary Team within the Buffalo District and from other agencies and industry representatives involved with the Buffalo Harbor project. The following are the Corps personnel who were most instrumental in conducting the investigation and preparing the text presented herein:

Buffalo District:

James W. Karsten	Former Study Manager Eastern Basin
Thomas C. Switala	Study Manager Eastern Basin
Daniel T. Kelly	Chief, Eastern Basin
Joan Pope	Acting Chief, Eastern Basin
Ronald J. Guido	Chief, Economics Branch
Roger E. Haberly	Economist
Jonathan Brown	Economist
Patricia Luvender	Economic Assistant
Michael Smith	Economic Assistant
Leonard Bryniarski	Ecologist
Kathleen McDermott	Social Scientist
Philip D. Frapwell	Biologist
James D. Boyle	Geotechnical Engineer
Judith Otto	Geologist
Richard Gorecki	Coastal Engineer
James Wheeler	Civil Engineering Technician
James Kaloustian	Civil Engineer
James Conley	Civil Engineer
Frank Parson	Legal Counsel
Bruce Sanders	Public Involvement Coordinator

Other agencies have contributed to this report through the preparation of supplemental reports and participation in agency workshops. The individuals involved are numerous and not easily identified. Therefore, recognition is provided by the names of their employing agencies as follows:

North Central Division, Corps of Engineers
City of Buffalo
Niagara Frontier Transportation Authority
U.S. Fish and Wildlife Service, Cortland, NY
New York State Department of Environmental Conservation
Industrial Users of Buffalo Harbor

The report itself was produced through the efforts of many other Corps personnel, including the following who contributed significantly to its preparation:

Roman Bartz	Chief, Drafting Section
John Acker	Drafting Section
Donna Davis	Drafting Section
Freda Soper	Chief, Word Processing Center
Lillian Stryczek	Word Processing Center
Diane Szymkowiak	Word Processing Center
Mary Ann Schultz	Word Processing Center
Jeanette Dezaiffe	Word Processing Center
Mattie Davis	Word Processing Center
George Key	Chief, Reprographics Branch

The Buffalo District Engineer during the initial phase of this Stage 2 study was Colonel George P. Johnson and the District Engineer during the final phase was Colonel Robert R. Hardiman, the Chief of the Engineering Division was Donald M. Liddell and the Chief of the Planning Division was Charles E. Gilbert.

Special thanks go to Mr. Richard Aguglia, Project Manager of Cleveland Harbor for the Buffalo District Army Corps of Engineers for his assistance and guidance in the preparation of this report.

Finally, the efforts of other individuals who participated in the study and report preparation but whose names have not been mentioned above, are gratefully acknowledged.

SECTION I

INTRODUCTION

STUDY AUTHORITY

The authority for conducting this study is derived from a Congressional resolution that was submitted by the Honorable Henry J. Nowak of the 37th New York Congressional District. The resolution which was passed on 9 May 1979 reads as follows:

"Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States. That the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Buffalo Harbor, New York, published as House Document No. 451, 87th Congress, 2nd Session and other pertinent reports, with a view to determining whether any modification to the recommendations contained therein are advisable at the present time and to determine the feasibility of navigation improvements to support increased or changing commercial activity and attendant facilities, including but not limited to bulk commodity transshipment facilities and modifications to realign the Buffalo River, New York, to accommodate passage and safe navigation of modern and larger ships operating on the Great Lakes and to make recommendations in a report to be submitted to the Congress."

SCOPE OF STUDY

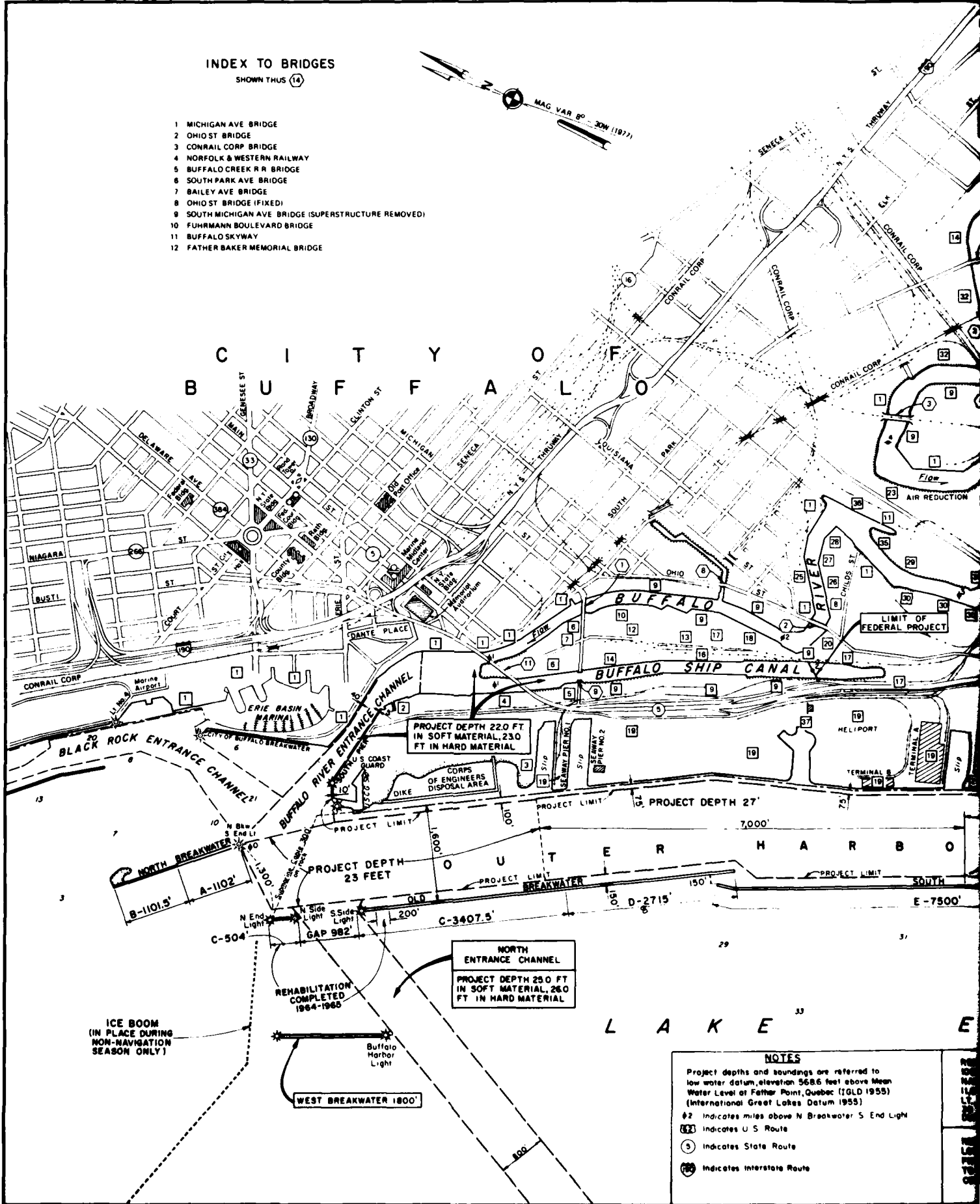
a. Purpose of Study. The Buffalo Harbor Study will investigate the feasibility of making commercial navigation improvements to the harbor in order to support increased or changed commercial activities. Although the study will emphasize commercial navigation, it will also consider improvements in the areas of recreation, environment, and water quality for possible inclusion in the context of the study.

b. Study Area. The area under consideration is shown on Figure 1. It consists of the Federal navigation channels and the various non-Federal slips, canals, and mooring areas. The Federal portion of the harbor is actually composed of an Inner and Outer Harbor. The Inner Harbor consists of the Buffalo River Entrance Channel, the Buffalo Ship Canal, and the Buffalo River. The Outer Harbor includes the North and South Entrance Channels and the navigation channel connecting them.

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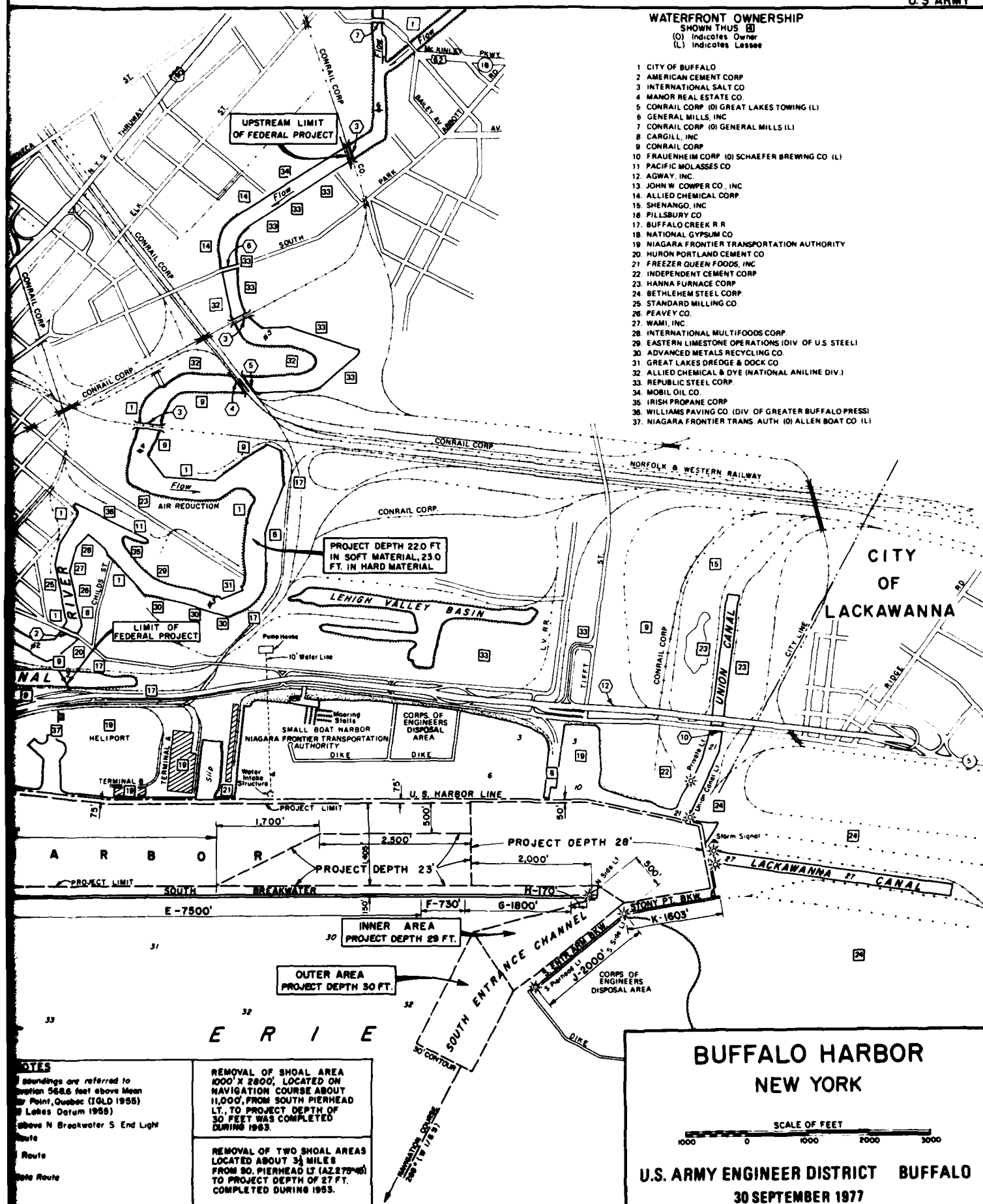
- 1 MICHIGAN AVE BRIDGE
- 2 OHIO ST BRIDGE
- 3 CONRAIL CORP BRIDGE
- 4 NORFOLK & WESTERN RAILWAY
- 5 BUFFALO CREEK RR BRIDGE
- 6 SOUTH PARK AVE BRIDGE
- 7 BAILEY AVE BRIDGE
- 8 OHIO ST BRIDGE (FIXED)
- 9 SOUTH MICHIGAN AVE BRIDGE (SUPERSTRUCTURE REMOVED)
- 10 FUHRMANN BOULEVARD BRIDGE
- 11 BUFFALO SKYWAY
- 12 FATHER BAKER MEMORIAL BRIDGE



WATERFRONT OWNERSHIP

SHOWN THUS (O) Indicates Owner
(L) Indicates Lessee

- 1 CITY OF BUFFALO
- 2 AMERICAN CEMENT CORP.
- 3 INTERNATIONAL SALT CO.
- 4 MANOR REAL ESTATE CO.
- 5 CONRAIL CORP. (O) GREAT LAKES TOWING (L)
- 6 GENERAL MILLS, INC.
- 7 CONRAIL CORP. (O) GENERAL MILLS (L)
- 8 CARGILL, INC.
- 9 CONRAIL CORP.
- 10 FRAUENHEIM CORP. (O) SCHAEFER BREWING CO. (L)
- 11 PACIFIC MOLASSES CO.
- 12 AGWAY, INC.
- 13 JOHN W. COWPER CO., INC.
- 14 ALLIED CHEMICAL CORP.
- 15 SHENANGO, INC.
- 16 PILLSBURY CO.
- 17 BUFFALO CREEK R.R.
- 18 NATIONAL GYPSUM CO.
- 19 NIAGARA FRONTIER TRANSPORTATION AUTHORITY
- 20 HURON PORTLAND CEMENT CO.
- 21 FREEZER QUEEN FOODS, INC.
- 22 INDEPENDENT CEMENT CORP.
- 23 HANNA FURNACE CORP.
- 24 BETHLEHEM STEEL CORP.
- 25 STANDARD MILLING CO.
- 26 PEAVEY CO.
- 27 WAMI, INC.
- 28 INTERNATIONAL MULTIFOODS CORP.
- 29 EASTERN LIMESTONE OPERATIONS (DIV. OF U.S. STEEL)
- 30 ADVANCED METALS RECYCLING CO.
- 31 GREAT LAKES DREDGE & DOCK CO.
- 32 ALLIED CHEMICAL & DYE (NATIONAL ANILINE DIV.)
- 33 REPUBLIC STEEL CORP.
- 34 MOBIL OIL CO.
- 35 IRISH PROPANE CORP.
- 36 WILLIAMS PAVING CO. (DIV. OF GREATER BUFFALO PRESS)
- 37 NIAGARA FRONTIER TRANS. AUTH. (O) ALLEN BOAT CO. (L)



Legislation* was passed by Congress in September 1982 to extend the study area to include the Niagara River shoreline of the city of Buffalo. Due to time constraints, this new area was not addressed in this report, but it will be examined in the final stage of study.

c. Study Assumptions. This study is being conducted on the basis of two basic economic assumptions. The first is that the Buffalo grain industry will continue to operate in Buffalo at its present level of activity throughout the life (1990 to 2040) of the proposed project. The second is that during this same period, the Buffalo steel industry will recover from its present low level of activity. These assumptions are based on interviews and surveys of the grain and steel industry and the review of a number of recent regional navigation studies.

PRIOR AND ONGOING STUDIES, REPORTS, AND IMPROVEMENTS

a. Corps Studies for Buffalo Harbor. Beginning in 1868, there have been a number of Corps of Engineers reports that address improvements to and modifications of the Buffalo Harbor commercial navigation project. A summary of these reports is provided in Table 1.

b. Other Corps of Engineer Studies. Other ongoing studies by the Corps of Engineers are pertinent to and may have an influence on future considerations at Buffalo Harbor. A summary of these various studies follows:

(1) The Navigation Season Extension Study - The purpose of this study, which was completed by the Detroit District in December 1979, was to determine the economic feasibility of extending the navigation season for all the Great Lakes and the St. Lawrence Seaway. Navigation on the GL/SLS presently occurs from about the first week in April to mid-to-late December. A limited 8-1/2 to 9-month season results in dis-economies to commerce and industry which resort to stockpiling of raw materials or to more costly alternate transportation routes to sustain year-round operations. This study recommended a navigation season extension to 12 months on the upper lakes and 10 months on Lake Ontario and the St. Lawrence River. The Final Feasibility Report (Stage 3) was completed and forwarded to Congress for their information.

(2) The Great Lakes Connecting Channels and Harbors Study - This current feasibility study by the Detroit District covers the upper Great Lakes Navigation System (Lakes Superior, Michigan, Huron, Erie, and their connecting channels). The purpose of this study is to determine the feasibility of modifications to the existing commercial navigation system, including the need to increase the system's draft (presently at 25.5 feet) and/or size of vessel using the system (presently limited to a vessel no larger than 1,100 X 105 feet). The study will also determine the feasibility of enlarging and/or segmenting the locks at Sault Ste. Marie.

* Wording not available as of this writing.

Table 1 - Prior Corps of Engineers Reports for Buffalo Harbor

Year of Report	Work Considered	Congressional Document	Recommendations	Action by Congress (R&H Act)
1868	:Old Breakwater (1)	:Annual Report	:Favorable	:23 June 1866
1876	:Extension of Old :Breakwater (1)	:Annual Report	:Favorable	:23 June 1874
1895	:Stony Point and :South Breakwater (1)	:Annual Report	:Favorable	:3 June 1896
1905	:South Entrance :Breakwater (1)	:H.D. 240, :59th Congress, :1st Session	:Favorable	:2 March 1907 (2)
1933	:Extension of South :Entrance and South :Breakwaters, deepen- :ing Outer Harbor to :present project :dimensions, and re- :moval of shoals on :approach to south :entrance.	:H.D. 46, :73rd Congress,	:Favorable	:30 August 1935
1941	:Deepening the North :and Buffalo River :entrance channels, :and deepening and :maintaining the :Buffalo River and :Buffalo Ship Canal :to present project :dimensions.	:H.D. 352, :78th Congress, :1st Session	:Favorable	:2 March 1945
1959(3)	:Deepening the south :Outer Harbor to 28 :feet, the inner end :of the south :entrance channel to :29 feet, and the :outer end of that :channel, and shoals :in the approach, to :30 feet.	:H.D. 151, :86th Congress, :1st Session	:Favorable	:14 July 1960
1965	:Collection and :removal of drift, :Buffalo Harbor, :Black Rock Channel, :and Tonawanda :Harbor, Niagara :River and Tributary :Waterways.	:S.R. 148 :85th Congress, :1st Session		
1980	:Removal of abandoned :abutments of South :Michigan Avenue :Bridge.	:Section 107, :1960 River :and Harbor Act	:Favorable	:15 December 1980

(1) Completed under previous project.

(2) Also Sundry Civil Act of 3 March 1905.

(3) First interim report on Buffalo Harbor under Great Lakes Harbors Study.

(3) St. Lawrence Seaway Additional Locks Study - The purpose of this current feasibility study by the Buffalo District is to determine the adequacy of the existing locks and channels in the U. S. section of the seaway with respect to present and future commercial navigation needs, and the advisability of their rehabilitation, enlargement, or augmentation.

(4) The Maximum Ship Size Study - This study was completed in 1977 by North Central Division, Corps of Engineers, to screen future vessel sizes and improvement alternatives for use in the Great Lakes Connecting Channels and Harbors and the St. Lawrence Seaway Additional Locks studies. One conclusion reached in this study was that the maximum economically sized bulk cargo vessel that would use the Great Lakes Navigation System would be 1,200 feet long by 130 feet wide. However, this study was subsequently revised and updated in 1981 to reflect current industry views that the maximum sized vessel that would use the Great Lakes Navigation System would be 1,100 feet long by 105 feet wide.

(5) National Waterways Study - This study examined the capabilities of the nation's existing waterway system and the additional waterway improvements necessary to effectively serve present and future transportation requirements of the nation. The study was conducted by the Institute for Water Resources, Corps of Engineers and was completed in August 1981. As discussed in the next section of the Main Report, "Problem Identification," growth rates developed in this study for iron ore and limestone were used, in conjunction with other information, to estimate future movement of these commodities at Buffalo Harbor.

(6) Great Lakes/St. Lawrence Seaway Regional Transportation Study - This study was conducted by Booz-Allen and Hamilton, Inc., during 1981 to investigate the feasibility of future modifications to the Great Lakes-St. Lawrence Seaway Navigation System. Individual study components included tonnage forecasts, fleet forecasts, and freight rate studies. In addition, the costs of alternative lock sizes were also compared with estimates of future navigation benefits. Preliminary conclusions reached during this study were further refined by Detroit and Buffalo Districts.

(7) Section 108d of Public Law 92-500 directed the Corps of Engineers to develop a program for the "restoration and environmental repair" of Lake Erie. The resulting Lake Erie Wastewater Management Study (LEWWM) by the Buffalo District has identified nutrient enrichment - particularly phosphorus in all of its forms - as the primary cause of heavy eutrophication in the western basin of Lake Erie and marginal eutrophication in the central and eastern basins. The study has determined that 44 percent of the phosphorus loading to Lake Erie is from nonpoint or diffuse sources such as that attached to sediment. The study will continue through 1982, and the "Final Study Report" will use results of pilot management programs on selected Lake Erie tributary watersheds to recommend specific implementation programs for these and unmonitored watersheds in the Lake Erie Basin.

STUDY PROCESS

The Buffalo Harbor Feasibility Study is being completed in three stages.

Stage 1, the initial planning stage, defines the scope and character of the feasibility study and provides a guide to subsequent planning by carrying out four planning tasks. The emphasis in Stage 1 is on Task 1, problem identification. The Reconnaissance Report defines broad planning objectives, formulates possible alternative measures for achieving the objectives, and produces a tentative impact assessment and evaluation. The level of detail is general and the planning tasks draw upon a broad data base which may be more qualitative than quantitative. The product of Stage 1 is a Reconnaissance Report which sets forth, in general terms, the study scope and management actions necessary to implement the study purposes.

Stage 2, the intermediate planning stage, is characterized by developing a range of alternatives to achieve the planning objectives without concentrating on highly detailed engineering designs. Potential impacts of these alternative plans are assessed and evaluated, concentrating on their significant consequences. Data should be sufficient to set forth and analyze alternative concepts and should narrow the choices to the most viable options available in the study area. The product of Stage 2 is a Preliminary Feasibility Report (PFR).

During the final stage, Stage 3, the recommended alternatives from the PFR are studied. Detailed design, assessment, and evaluation necessitate specific data and well-defined study assumptions. The plans must be sufficiently detailed to facilitate effective choices for recommended plan implementation. A recommended plan will state the planning objectives forming the basis for the technical and institutional measures selected to accomplish resource management. Both nonstructural and structural measures are described and the means of implementing and managing specified. The product of Stage 3 is a Final Feasibility Report (FFR).

If the recommended plan is favorable for Federal involvement, then the Federal and non-Federal cost-sharing will be described. After review of the FFR at Division and Washington levels, the document will be submitted to Congress for their action.

In each of these three stages, plans are developed through an iterative process of four tasks (see Figure 2). These tasks are: Task 1 - Problem Identification; Task 2 - Formulation of Alternatives; Task 3 - Impact Assessment; and Task 4 - Evaluation.

STUDY PARTICIPANTS AND COORDINATION

Public involvement programs are conducted as an integral part of the Corps planning process due to the many divergent interests that must be considered before an acceptable final plan can be developed. In addition to providing a forum from which the public may express their needs, interests, and concerns relating to a specific Corps project, it allows the Corps to present timely

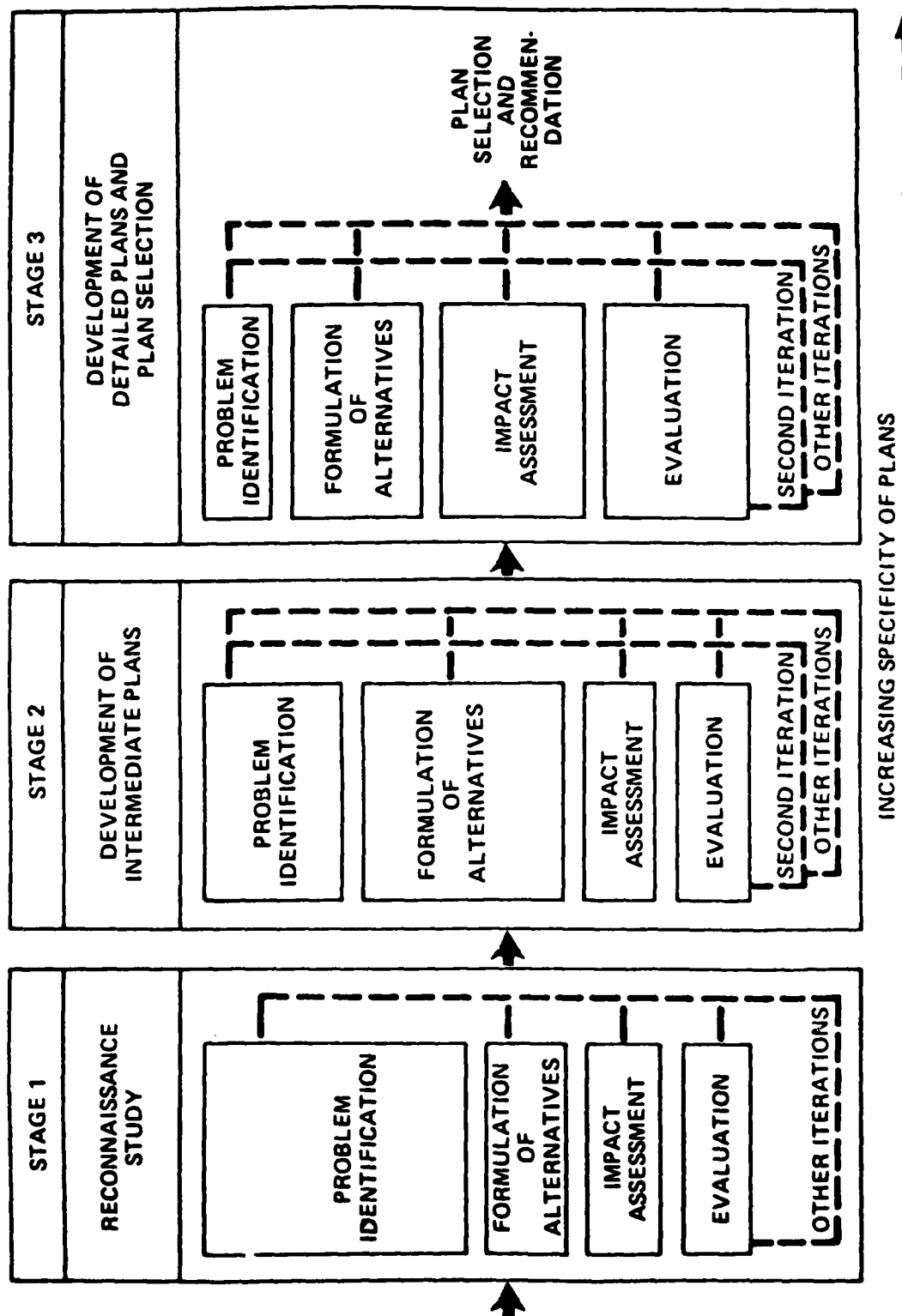


Figure 2

information to those who choose to participate so they may do so with a relatively full and complete understanding of all aspects of a study.

Coordination with Federal, State, and local agencies and private interest groups affected by actions of the Buffalo Harbor Study will be maintained throughout the study period to ensure that their viewpoints are considered in any proposed actions. A master mailing list composed of over 300 Government agencies, industrial organizations, and special interest group representatives, in addition to Congressional and State legislators is used to disseminate written information on the progress of the study and to provide notification of all public meetings. This has resulted in a working relationship with a number of different organizations with a sincere interest in the development of Buffalo's waterfront and the commercial navigation activities associated with it.

CURRENT STATUS OF STUDY

a. Stage 1 Study. Stage 1 of the Buffalo Harbor study was initiated in December 1979, and completed in April 1981. It resulted in a 379-page Reconnaissance Report, which was summarized in a 12-page pamphlet entitled Report Summary - April 1981. The Reconnaissance Report concluded that the study should continue on to investigate three categories of harbor improvements:

(1) Deepening of the Buffalo River and Ship Canal for vessels up to 700 feet in length,

(2) Transshipment of bulk commodities from the Outer Harbor to upriver industrial facilities, and

(3) Alteration of the south entrance of the Outer Harbor for safe all-weather, 1,000-foot vessel operation.

It also found that further investigation of realignment of the Inner Harbor (i.e., the Buffalo River and Ship Canal) for operation of 1,000-foot vessels is not warranted at this time.

While the reconnaissance effort was being completed, a supplementary study was initiated to provide a thorough investigation of revitalization efforts and potentials for the harbor area. The purpose of this study was to present a set of revitalization alternatives for the harbor area that could be used by the Corps of Engineers as a backdrop against which commercial navigation alternatives could be more fully evaluated during Stages 2 and 3 of the planning effort for Buffalo Harbor. In addition, the study offered an opportunity for the Corps to identify specific recreational measures within its authority that could be carried forward in the planning process and eventually integrated with the commercial navigation alternatives identified in the reconnaissance study. It also identified the need for coordinated planning and development of the Buffalo waterfront. The completion of the Reconnaissance Report marked the end of the Stage 1 planning effort.

b. Stage 2 Study. Stage 2 commenced immediately with the awarding of a year-long biological sampling contract, completion of the revitalization report, and the refining of the course for Stage 2 study. Additionally, a study concerning drift and debris problems in Buffalo Harbor and adjacent areas was initiated. That study represents an attempt to complete action on a 1965 Corps report regarding drift problems in Buffalo Harbor and adjacent areas. The 1965 Corps document recommended that a Federal project be established for the continuous removal of floating drift. Unfortunately, the review board of the Corps found that there was no Federal interest in the project, and the report was placed in the deferred category. The Buffalo District was able to obtain approval to reactivate the 1965 drift removal study and combine its authority with that of the Buffalo Harbor Study because of recent changes in legislation which have established a Federal interest in the drift and debris problem. The reactivation of the drift study is also consistent with the recommendations of the revitalization report which identified four measures that the Corps could participate in under any of the growth scenarios. These measures include: (1) creation of offshore islands; (2) expansion of the NFTA Small-Boat Harbor; (3) development of a new marina between the NFTA Small-Boat Harbor and the Cargill Pool Elevator; and (4) removal of debris from harbor waters. Stage 2 study is scheduled for completion in December 1982.

THIS REPORT

a. General. The overall organization of this report consists of a Main Report, a series of Technical Appendices A through E, a Pertinent Correspondence Appendix F, a Public Involvement Appendix G, Reports of Others Appendix H, a Drift and Debris Removal Appendix I. The Main Report is written to have both the general and technical reader a clear understanding of the study, the study results, and the key decisions and conclusions. The Main Report is written to give both the general and technical reader a clear understanding of the study, the study results, and the key decisions and conclusions. The Technical Appendices provide additional detailed information on the design, costs, and benefits of the alternatives studied. The Pertinent Correspondence Appendix includes copies of pertinent correspondence with organizations and individuals, significant in the development of this Stage 2 study. The Public Involvement Appendix includes minutes of the workshop meetings conducted during the course of this study. Reports of Others (Appendix H) includes the U. S. Fish and Wildlife Service's "Planning Aid Letter" and Intermediate Report. The Drift and Debris Removal Study Appendix contains the entire Stage 2 evaluation of the problem. It was written as a complete document in itself, to allow the Buffalo District the flexibility of separating it out from the commercial navigation effort at a later date.

b. Specific Investigations for this Report - Field.

(1) Preliminary Real Estate Appraisal - A preliminary real estate appraisal was prepared in the summer of 1982 by personnel of North Central Division. The purposes of this preliminary real estate appraisal were to

estimate: the value of the land that would be acquired in fee title for various alternatives; the cost of obtaining temporary construction easements; and the cost of purchasing several buildings that would have to be demolished or relocated for various alternatives. This information was then included in the cost estimates prepared for each alternative. Results of this preliminary real estate appraisal are presented in Appendix D, "Cost Estimates."

(2) Biological Sampling Survey - An intensive study of the Buffalo River, Ship Canal, and Outer Harbor of Buffalo, NY, was undertaken between April 1981 and May 1982 with the following general objectives:

- (a) To evaluate existing conditions in the river and harbor and to evaluate the biological impact of dredging the existing channel deeper in the Buffalo River and Outer Harbor;
- (b) To evaluate the biological impact of alternative proposals to dredging such as transshipment of raw materials by conveyor;
- (c) To evaluate the biological impact of removal of debris, old pilings, etc. along the Buffalo shoreline;
- (d) To evaluate existing conditions in potential disposal areas and to evaluate the biological impact of spoil disposal in these areas; and
- (e) To provide a functional assessment of the ecological components studied and evaluate their significance with and without project implementation to the area ecosystem.

(3) Drift and Debris Inventory - During the summer and early fall of 1981, a field survey was conducted by the Buffalo District to determine the locations and approximate quantities of drift and debris in Buffalo Harbor and adjacent waterways. The items qualifying as drift and debris included old docks, pilings, sunken vessels, abandoned buildings, and loose floatable material either on the banks or in the water. As previously mentioned, the results of this work and the associated economic analysis are shown in Appendix I.

c. Specific Investigations for this Report - Office.

(1) Geotechnical Study - A survey was conducted throughout 1981 to obtain available subsurface exploration information in the area of Buffalo Harbor. Information was obtained from various local sources, both public and private sectors, and from previous studies by the Buffalo District. In the area of the alternatives being examined, the surficial channel sediment is composed of sandy, clayey gravel. The channel borings contain primarily fill at the surface with laminations of clay and sand below. Bedrock may be encountered close to the surface in certain areas due to the irregular nature of the rock elevation. A cursory trip was made along the Buffalo River to sedimentologically evaluate the uppermost reaches. A preliminary sediment analysis was also conducted to estimate the increase in maintenance dredging

associated with the various alternatives. A preliminary construction material survey was conducted to determine the availability of stone materials. It was determined that there are several sources of armor stone, underlayer stone, bedding and core stone, and railroad ballast within a radial distance of 30 miles from Buffalo Harbor. Additional details on this study are provided in Appendix E, "Geotechnical."

(2) Cultural Resources - A preliminary assessment which relates the history of Buffalo Harbor and adjacent waterways was conducted to identify areas of historical significance and to provide additional insight into the development of the Port of Buffalo. The results of this investigation were coordinated with the New York State Historic Preservation Officer and the National Parks Service. Reference Appendix I (Sub-Appendix F - Cultural Resources).

(3) Fleet and Tonnage Forecast - Commodity movements of iron ore, limestone, sand and gravel, and grain at Buffalo Harbor for the 10-year period, 1971-1980, were analyzed in order to establish a historical volume of cargo shipped at Buffalo Harbor. These historical tonnage levels were then used in conjunction with data obtained from interviews and surveys of the main bulk commodity users of Buffalo Harbor to estimate future commodity movements at Buffalo Harbor to the year 2040. In addition, the historical fleet composition in use at Buffalo Harbor for the 5-year period, 1976 to 1980, was also analyzed. Future fleet compositions for various alternatives (including No-Action) were then developed to the year 2040 by changing the historical fleet composition based on such factors as past vessel usage trends, the average age of the present fleet, the trends for new vessel construction on the Great Lakes, and future vessel replacement plans of various shipping companies that call at Buffalo Harbor. These tonnage and fleet forecasts were then used to estimate navigation benefits that would accrue if Buffalo Harbor was modified. The results of these forecasts are presented in Appendix B, "Economic Evaluation."

(4) Analysis of Channel Depth Requirements - As will be discussed in Section II of the Main Report, "Problem Identification," navigation channels at Buffalo Harbor do not provide adequate channel depths for most bulk cargo vessels. Thus, these vessels are forced to navigate light-loaded (i.e., at less than the Great Lakes System's maximum safe draft of 25.5 feet at LWD), resulting in increased transportation costs.

As part of this Stage 2 study, an analysis of channel depth requirements for bulk cargo vessels was undertaken by Buffalo District personnel. Five factors were evaluated: static draft, squat, roll, pitch and heave, and underkeel clearance. The resulting required channel depths were then incorporated into several harbor modification plans which involved channel deepening. Results of this analysis are discussed in Section II of the Main Report and in Appendix A, "Coastal Engineering Design."

(5) Review of Corps Permit Files - As will be discussed in Section II of the Main Report, "Problem Identification," shipping interests indicated a need to study the feasibility of deepening the navigation channels at Buffalo

Harbor. This proposed deepening would make the depth of the navigation channels compatible with the Great Lakes System's maximum safe draft of 25.5 feet.

As part of the study of deepening the navigation channels, the effects this deepening would have on the stability of the existing bulkheads was analyzed (i.e., whether deepening the navigation channels would cause failure of the existing bulkheads). Basic data on the construction of the existing bulkheads was obtained from Corps Permit files for these bulkheads, when available. A stability analysis was conducted on the bulkheads. The results were expanded to cover the remaining bulkheads for which permit information was not available. When the analysis indicated that deepening would cause failure of the existing bulkheads, replacement of these bulkheads was included as a plan component of the alternative and its non-Federal cost was included in the cost estimate of the alternative. Additional details on this analysis are provided in Appendix C, "Design."

(6) Disposal of Dredged Materials - Due to the sheer number of alternatives that were to be considered in Stage 2, it was assumed early on that the material would have to be contained and that it would be placed in Dike 4 adjacent to Bethlehem Steel. Anticipating that in Stage 3 these assumptions would have to be validated, three things were done in Stage 2. These were: (a) a preliminary evaluation of the sediments to be dredged to determine if they would indeed need to be contained; (b) an analysis of capacity versus rate of fill for the dike; and (c) an investigation into the legality of using Dike 4 for a resultant project. The results of this work are discussed in Section II of the Main Report, "Problem Identification." Details of the work are contained in Appendix H, "Reports of Others."

Preliminary sediment analysis indicates that a great portion of any material dredged from Buffalo Harbor would have to be placed into a confined dredged material disposal area. At times, these areas are not completely filled and when left to revert to a natural state can provide substantial wildlife and wetland type habitat (i.e. Times Beach). It has not yet been determined, where or how much dredging will occur; or, what exactly will be done with the dredged material. Once the most feasible plans are more firmly established, a number of dredge disposal alternatives must be examined in further detail. This will include the possibility of establishment of wetland areas in connection with dredging as set forth by Water Resources Policies and Authorities (ER 1165-2-27).

LOCAL RESPONSE TO STAGE 2 EVALUATION OF ALTERNATIVES

On 14 July 1982, the Buffalo District held a workshop with the commercial harbor users. Then on 16 September 1982, the Buffalo District held a workshop with the general public in the auditorium of the main branch of the Buffalo and Erie County Public Library. The purpose of both meetings was to show everyone the process that was used to get to the eight alternatives that were evaluated in Stage 2 and to obtain their input before the final Stage 2 recommendations were made.

During these meetings, support was given to Plans IIIg, provided the rail spur was moved further to the north in Stage 3, IIIh, and IIIi. Additionally, although there were a number of questions regarding the overall procedure evaluating the alternatives, there were no major objections to what had been done to date.

Further information on the meeting results is contained in Appendix G.

SECTION II

PROBLEM IDENTIFICATION

The purpose of this section is to inform the reader of the water and related resource problems and needs in the study area which this study addresses under the existing authority. This section includes a brief history of the harbor; presents information on the existing physical and human environment and the commercial navigation facilities in the study area; discusses the problems, needs, and opportunities present to modify the existing commercial navigation features of Buffalo Harbor and other water-related resource problems for which this study seeks a solution; reviews the planning constraints under which this study was conducted; discusses the national and specific planning objectives of the study; and reviews the conditions that would exist if no Federal action was taken.

HISTORIC OVERVIEW

The development of Buffalo Harbor was closely linked to increases in trade that were a result of advances in industrial technology. Buffalo's port activity grew because it functioned as a transshipment point between the Midwest and the East Coast, particularly New York City.

a. The Early Period: 1800-1818.

At the beginning of the 19th Century, the east side of the Niagara River was a densely wooded area with scattered paths. In the area of the present city of Buffalo, a road from the east leading to the Black Rock Ferry existed before 1800. This ferry reportedly existed during the Revolutionary War and provided a means for British Loyalists to move to Canada during and after the war. Later, it helped American settlers pass through Canada.

In 1811, Buffalo Creek was navigable for about 4 miles and a pier was proposed which would run into the lake at its outlet to form a harbor. However, the port of entry was moved from Buffalo to Black Rock 8 months out of each year because the harbor had not been improved. During the War of 1812, all plans for improvement of the harbor halted. Buffalo was burned by the British in December of 1813 (White, 1898: 171-175).

After the War of 1812, the commercial importance of Lake Erie developed. Salt was the most important product shipped west; but whiskey, dry goods, naval stores, groceries, hardware, mill irons, and farm tools also were shipped west. Furs, fish, and building stone were shipped east (White, 1889: 264).

Work on the Erie Canal, postponed by the war, was started in 1817. This opened the question of whether the western terminus of the canal would be at Black Rock or at Buffalo. In 1818, a group of Buffalo citizens set out to

improve the harbor to make Buffalo a more favorable locus for the western terminus of the canal (Kent, 1974: 7).

The Buffalo Harbor Company was organized in 1819 and applied to the State Legislature for aid. The Legislature approved a \$12,000 grant for the building of a harbor at the mouth of Buffalo Creek and in 1820, work began. Buffalo Creek was surveyed and a pier was built into the lake, constructed of cribs of hewn timber filled with stone; 50 rods (16.5 feet/rod) of pier were built the first season.

Buffalo Creek entered Lake Erie about 60 rods north of its present entrance and ran parallel to the shore approximately 20 rods from it. A new channel had to be cut across this point of sand separating the creek from the lake. The new channel was approximately 90 feet wide at the bottom and at least 5 feet deep. This provided a straight channel through which small vessels could enter (Wilkeson 1902: 194-197). The harbor was completed in 1821. The United States Government assumed control of the entrance channels from the Outer Harbor to its junction with Buffalo Creek and the City Ship Canal in 1826 (Symons and Quintas, 1902: 249). The Erie Canal was completed in 1825 and Buffalo was chosen as its western terminus (Symons and Quintus, 1902: 241-244). Buffalo thereupon entered a period of rapid growth.

b. The Canal Era - Internal Harbor Expansion, 1800-1860.

The Erie Canal was connected to Buffalo Creek by Little Buffalo Creek, later known as the "Prime Slip" (Baxter and Heyl, 1965: 12). The canal was 40 feet wide at its top and 28 feet wide at its bottom with a 4-foot depth and a towpath alongside. By 1835, enlargement of the canal was recommended. In 1832, Buffalo, with a population of 10,000, was incorporated as a city (Barrick, 1970: 8-14).

It soon became apparent that increased facilities would be needed to accommodate transshipment between canal and lake navigation and to provide for stations or harbors at Buffalo. The first contract for an adjunct canal was let in 1831. In 1833, an estimate for the Main-Hamburg Canal was prepared by the Buffalo Common Council, and the contract was let in 1836. Through a combination of private, municipal, and State enterprise, an important series of slips were built connecting the Erie Canal with Buffalo Creek and Lake Erie. The Main-Hamburg Canal, about 1-mile in length running from Hamburg Street west to Main Street, became virtually an extension of the Erie Canal (Whitford, 1906: 589). It was completed in 1851 (Baxter and Heyl, 1965: 16-17).

By 1859, the entrance and inner harbor had just about taken on the shape they would retain until the end of the century. Improvements were chiefly in maintenance and increasing depths to accommodate larger vessels (Symons and Quintus, 1912: 248). Before 1859, 1,000 tons was considered to be a large vessel; by 1900, ships were nearing 10,000 tons capacity (Baxter and Heyl, 1965: 8).

The land in the Fuhrmann Boulevard area was poorly drained and swamplike, and was often inundated by storms from the southwest. Sections of a protecting

sea wall were built to protect facilities near the creek. A mile-long sea wall was planned in 1838, and by 1866, it had reached 5,400 feet (Barrick, 1970: 14).

In 1842, the Dart Elevator was built at the junction of the Evans Ship Canal and Buffalo Creek (Dart, 1879: 400-401). This was the first commercially successful grain elevator for the mechanical unloading and storage of grain, in the world (Barrick, 1970: 14). Twenty-two years later, Buffalo had 27 elevators plus two floating elevators (Dart, 1879: 402). By the late 19th Century, Buffalo became the principal grain port of the world. All wheat grown east of the Rocky Mountains passed through Buffalo. The Central Wharf, west of the foot of Main Street, was an important center for grain merchandising. The Board of Trade built a structure here in 1845 and the wharf became the major commercial center in Buffalo. It was abandoned in 1883 (Barrick, 1970: 17).

c. Railroad Expansion and Outer Harbor Expansion, 1860-1911.

The decline of the Erie Canal's importance began when restrictions that had prevented the railroads from competing with the canal were lifted in 1851. By 1869, the tonnage carried by the railroads exceeded that of the canal. In 1882, the State dropped tolls in the canal in an attempt to put it into a better competitive position. However, this did little to reverse the trend. By the turn of the Century, the canal was totally eclipsed by the railroads. However, Buffalo still held a locational advantage at the eastern end of the Great Lakes, and by 1896, the improved transshipment capabilities resulting from the development of the railroad system made Buffalo the world's fifth largest port in total tonnage. In terms of grain transshipment alone, Buffalo retained its position as the leading port in the world.

With the shift to rail transport, passenger boats on the Erie Canal were discontinued during the 1860's. By 1900, the canal was near a state of collapse even though it had been deepened to 20 feet. Buffalo Harbor reached its peak in 1862 with an average of 68 vessels arriving or departing each day (Barrick, 1970: 18). By 1885, Buffalo had 20 miles of inland waterways; by 1902, there was a marked decline. The Hamburg Canal was abandoned, larger vessels were being used, and the era of animal power was passing (Baxter and Heyl, 1965: 8). Attempts to create a current to cleanse the canals failed and they were gradually filled in.

By 1867, plans were being made for an Outer Harbor breakwater (Barrick, 1970: 14). Construction of the 4-1/2 mile Outer Harbor at Buffalo began in 1869 with the first section of the outer breakwall. Completed in 1894, it extended 7,609 feet parallel to the shoreline south of the mouth of the Buffalo River and 1,600 feet from the harbor line. Subsequent construction of the South Breakwater during 1897-1904, the 3,810-foot Stoney Point Breakwater during 1898-1911, and the 2,303-foot North Breakwater completed the basic foundations of the Outer Harbor. Also during this time, a catch-sand pier was built 1,148 feet into the harbor to check encroachments of northerly-drifting sand into the mouth of the Buffalo River (Drescher, n.d.).

In 1879, the Delaware, Lackawanna, and Western Railroad acquired title to underwater rights behind the north pier. Amidst considerable controversy, it filled the land, demolished the original pier, and built a new one (Barrick, 1970: 21).

Throughout this period, Buffalo experienced rapid growth. By 1850, its population was 42,261. It grew to 155,134 by 1880 and to 255,664 by 1900 (Barrick, 1970: 14, 25).

During the period of 1870 to 1900, the mouth of the Buffalo River was deepened to 20 feet, accommodating lake freighters having a capacity of 10,000 tons (Barrick, 1970). By 1887, Buffalo was criss-crossed with 11 different railroads; track mileage in the city alone totaled 436 miles (Drescher, n.d.). Hydroelectric power from Niagara Falls was provided to the city in 1896 (Thompson, 1966). Buffalo grew in importance as a manufacturing and shipping center; by 1900, only Chicago and New York exceeded the waterborne traffic of Buffalo.

d. Harbor Development in the Twentieth Century.

By the turn of the Century, the decline of the canal was complete. In 1900, activity shifted to Buffalo Creek and to the City Ship Canal with the use of larger capacity ships (Barrick, 1970: 18).

Originally, the lower part of the Buffalo River served as the only harbor; no Outer Harbor existed. Entrance to the Buffalo River was made directly from the lake. The original channel was narrow and shallow (about 8 feet), and a gravel bar at times practically closed the harbor to navigation. To improve the harbor, north and south piers were constructed at the river entrance. The original project, adopted by the River and Harbor Act of 20 May 1826, provided for the rebuilding of piers constructed earlier. The project was modified at various times to provide breakwaters and greater channel depths. In 1916, the Delaware, Lackawanna, and Western Railroad widened the river mouth 90 feet by removing the north pier and dredging (Grant, 1941: 9). The existing U. S. Army Corps of Engineers project began with the River and Harbor Act of 25 July 1912, which provided for:

1. An Outer Harbor about 4-1/2 miles long and 1,600 feet wide, formed by a breakwater system approximately parallel to the shore from Stoney Point to the head of the Niagara River, with two entrances near the north and south ends;
2. A south pier at the entrance to the Buffalo River of 1,760 feet, removal to a depth of 27 feet of three small shoals on the direct route to the south entrance;
- 3 and 4. Deepening the Outer Harbor, north entrance, the river channel, and enlargement of the inner end of the Buffalo River channel, and removal of the Watson Elevator site;
5. Maintaining existing channels along the Buffalo River and Ship Canal at a depth of 21 feet.

In 1921, the mouth of Buffalo Creek was dredged and several of the islands removed (Barrick, 1970: 14). After 1927, the State deepened the Erie Basin to 21 feet. The city of Buffalo provided a pier with two slips on the Outer Harbor at the foot of Michigan Avenue and three docks on the Buffalo River (Grant, 1941: 12).

By 1926, the Erie Canal at Buffalo was being filled; in that year, the section adjacent to the Erie Basin was completely filled. By 1941, it was filled to just south of Day's Point (Barrick, 1970: 41). Ultimately, the bed of the Erie Canal became the route of the Niagara Thruway (Baxter and Heyl, 1965: 7).

The harbor line, proposed as early as 1894, was established as a coincidental bulkhead and pierhead line beyond which no unconfined filling would occur in the Outer Harbor (U. S. Army Corps of Engineers, 1894). Shoreline modifications and pierhead structures in the Outer Harbor developed as a result of industrial growth. By 1939, two municipal piers with slips, a shipbuilding wharf, a grain elevator, a package freight terminal, and one Ford Motor Company slip existed in the Outer Harbor as well as the Union and Lackawanna Canals at the south end of the harbor. The area, including the present small-boat harbor, was defined by this time. It lay across from the Lehigh Valley Basin, delineated in the Outer Harbor by the Canadian Pool Terminal Elevator on the south and the Terminals and Transportation Corporation of America Pier on the north (U. S. Army Corps of Engineers, 1939). These basic structures define the area today. Continued growth, pierhead additions, and land filling have further modified the shoreline.

By 1939, the Port of Buffalo supported 60 terminals for handling all types of cargo. Demand for food goods generated by World War II kept cargos in coal, steel, limestone, oil, and grain at high levels. In 1942, Buffalo area industry produced 5 billion dollars worth of goods. Grain handled in 1945 reached 257 million bushels, a significant rise when compared to the 5-year annual average between 1933-1937 of 98 million bushels (Barrick, 1970).

The opening of the Panama Canal in 1914, the growing use of alternative inland waterways, and the opening of the Welland Ship Canal as part of the St. Lawrence Seaway, rerouted significant lake traffic away from Buffalo. By 1946, Buffalo had declined to fifth in importance of the Great Lake ports and to 12th of all ports in the United States (Barrick, 1970).

The Port of Buffalo has an advantage in its ability to handle bulk specialty cargo (Barrick, 1970). Bulk cargos in 1975 amounted to over 500,000 tons (NFTA). Today, substantial bulk cargos of grain, iron ore, and limestone are handled through its 45 wharves and piers. Currently, the port is seventh in size of the 54 Great Lakes ports and 28th in size when compared to 40 major U. S. ports (Great Lakes Laboratory, 1979). Thus, the port's transshipment activity has gradually declined since the beginning of the 20th Century as its equipment aged, as transportation networks have diversified, and as shipping on the lakes declined relative to rail shipments. A peak of over 200,000,000 bushels of grain was shipped through Buffalo during the early 1940's, but only because of World War II conditions.

Buffalo's port activity has now declined to a point where it is of local significance only. Aggregate tonnage over the last 10 years has increased, but this reflects a trend toward the handling of bulk commodities and not an increase in shipping traffic.

At present, a combination of new projects and plans are being implemented in hopes of revitalizing the waterfront. The Erie Basin Marina, Waterfront Village, Shoreline Apartments, the Naval and Servicemen's Park, the Tifft Farm Nature Preserve, and the River Walk are among the ongoing projects which are gradually changing the face of the waterfront. Today, with renewed interest, the Waterfront is again perceived as a future showcase of the city's rebirth.

EXISTING CONDITIONS

a. Physical Environment.

(1) Location - The city of Buffalo, NY, is located at the eastern end of Lake Erie, 176 miles northeast of Cleveland, OH, and 22 miles east of Port Colborne, Ontario, Canada (the Lake Erie terminus of the Welland Canal). Buffalo harbor consists of a breakwater-protected lakefront harbor in Lake Erie and improved navigation channels on the Buffalo River and Buffalo Ship Canal.

(2) Topography - There are three major topographic regions included within Erie County: (1) a portion of the Tonawanda Plain, (2) the Erie Plain, and (3) the Allegheny Plateau. Elevation rises from north to south. The Onondaga Escarpment is approximately 40 feet above sea level; however, elevation in the southeastern portion of the county (the Allegheny Plateau) rises to 1,945 feet.

The Tonawanda and Erie plains were covered by glacial lakes and are, therefore, characterized by a level to gently rolling topography. Glacial drift is of considerable depth in the Allegheny Plateau area. Following glacial retreat, erosion by streams draining northwestward off the plateau, and then westward across the lowland plains has created the present hilly topography in this portion of the county.

(3) Geology. Erie County lies within the Erie-Ontario Lowland physiographic region of the Interior Plains Division. Water-formed sedimentary rocks, consisting of interbedded shales, siltstones, sandstones, limestones, and dolomite date from the Silurian and Devonian periods (450 to 350 million years ago). The bedrock formations ranging from the Camillus Shale of the Middle Silurian through the Canadaway Group of the Upper Devonian, dip southward at an average of 40 feet per mile. Differential erosion left the more resistant rocks as escarpments separating the low irregular surfaces of the more erodible rocks. The southward dip of bedrock and the rising topography from north to south have caused the outcrop of individual formations to occur with the oldest units appearing in the north and the youngest in the upland areas in the southern portion of the county.

The area was glaciated during the last glacial stage (Wisconsin) of the Pleistocene epoch. Four major advances of glaciers deposited till; an unstratified drift of clay, sand, and gravel; as terminal and ground moraines. Where lakes were formed by the northward retreat of the ice mass, lacustrine deposits of clays and silts were formed. Drift deposits vary in thickness from less than 50 feet to 600 feet near Chaffee.

The formation of the Great Lakes system, including Lake Erie, occurred during the Pleistocene epoch. The continental ice cap spread southward from Canada eroding bedrock and depositing debris as the glacier retreated. Preglacial valleys were deepened or filled by glacial action, thus forming the basin of the five lakes. Meltwaters were ponded in the basins, and as drainage was established through the St. Lawrence River to the Atlantic Ocean, the present Great Lakes were formed.

The city of Buffalo and the immediate environs are located in an area of glacial deposits of till and clays overlying the Onondaga Limestone Formation. These deposits are the parent material from which soils in the area were formed.

(4) Mineral Resources - There are four companies mining limestone in Erie County (ENCRPB, 1978a) and numerous sand and gravel operations mining glacial deposits. In addition, there are approximately 20 active natural gas fields and six storage areas in the county. The largest active gas field lies under portions of Amherst, Clarence, Newstead, Lancaster, and all of Alden. Another large active gas field lies under the West Seneca/Buffalo area. (NYSDEC, 1977 and ENCRBP, 1978a).

(5) Soils - Approximately 13 soil associations, including undifferentiated urban land are represented within Erie County. Area soils were formed from glacial deposits in combination with natural weathering processes over time. Consequently, most are gently sloping to nearly level, or depressional soils. In general, clayey soils are located on the lake plains and loamy soils in the glacial till uplands. Slopes vary from 0 to 3 percent to three-35 percent slopes.

The major association surrounding and including the city of Buffalo is undifferentiated urban land. This soil exhibits artificial characteristics because it has been extensively excavated, filled, and graded. Land use limitations are highly variable and require on-site investigation for even a preliminary assessment of potential uses.

(6) Climate - Erie County is characterized by a humid, continental climate experienced by most of the eastern United States. Prevailing winds are westerly, with a secondary circulation system emanating from the Gulf of Mexico in summer and Canada in winter. The Buffalo Harbor area climate patterns are similar to those of Western New York; however, the proximity of Lakes Erie and Ontario creates significant differences. Primarily, temperatures are moderated; higher relative humidity and precipitation, and stronger winds are common.

There are six monitoring stations in Erie County including those at the Buffalo Airport, Colden, Elma, the Gowanda State Hospital, South Wales, and Wales. Climatological data relating to temperatures and precipitation were compiled by the National Oceanic and Atmospheric Administration (NOAA) for the period 1931 to 1960. This section presents a discussion of various factors determining the climate of the study area, including temperature, precipitation, wind, storm frequency, and visibility.

(a) Temperature - At the stations recording temperature, the annual average temperature for the period of record (1931-1960) is 46.7 at Buffalo and 46.4 at South Wales in Erie County (ENCRPBa, 1978). The maximum temperature in South Wales was 103°F during July and the minimum was -31°F. Buffalo registered a high of 99°F occurring in August, and a low of -12°F in December. The growing season lasts from May to October with frost occurring from 15 October to the first of April. Extremes generally vary 30°F above and below the average maximum and minimum temperatures.

(b) Precipitation - Average annual precipitation in Erie County varies from 30 inches in the northern sector to 42 inches in the higher elevations near Cattaraugus County. In the city of Buffalo, the average rate of precipitation is 35.69 inches. Average seasonal precipitation varies only slightly with 2.87 from May to October and 3.07 in the winter months from November to April. Secondary circulation systems from the Gulf of Mexico in summer and Canada in the winter each cause frequent precipitation and account for the minimal seasonal variation (ENCRPBa, 1978).

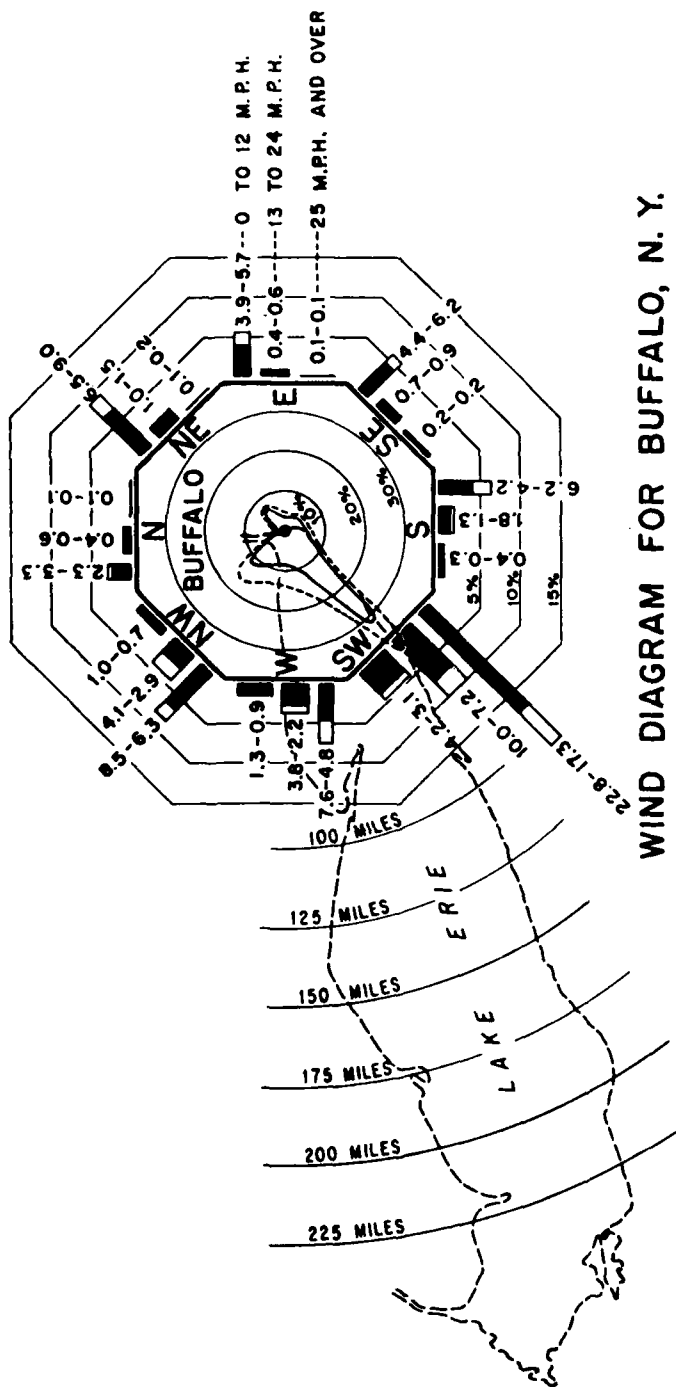
Snowfall averages 92.9 inches per year in Buffalo, most of which falls between November 1st and the end of March (Hassan and Sweeney, 1972); however, it may vary from 80 to 140 inches per year throughout the county.

(c) Wind - The major climatological factor in the area is wind. Prevailing winds are westerly, with secondary systems as described in the previous section also operating seasonally. The predominant determinant of wind direction in Buffalo is Lake Erie. The average monthly speed is 12.5 miles per hour (mph) with 14-16 mph winds in winter and 10-11 mph in summer. The long axis of the lake and configuration of the north shore causes a west-southwest channeling effect. Speed increases over the lake because of lack of friction at the water surface and the temperature gradient between the lake and land. The wind speed may double near the shore and is highest in winter because of the presence of intense pressure systems (Hassan and Sweeney, 1972). A wind diagram is presented on Figure 3.

(d) Storms - Windstorms, caused by pressure systems and the interplay of warm and cold air masses, occur during the winter and summer months. Large cyclonic storms move easterly across the Great Lakes two to three times a week. During the summer, storms are usually less frequent and tend to moderate temperature and humidity in the Buffalo area.

b. Natural Environment.

(1) Air Quality - The air quality for the Buffalo Harbor and River is classified as Level IV according to New York State Department of



BUFFALO HARBOR STUDY WIND DIAGRAM

U S ARMY ENGINEER DISTRICT BUFFALO

Environmental Conservation (NYSDEC). The Level IV classification is indicative of densely populated areas, primarily commercial office buildings, department stores and industries in large metropolitan complexes, or areas of heavy industry. New York State's air quality classification system is based on social and economic development and the associated pollution potentials that are likely to exist within these given land use areas. Heavy development and industry as steel mills, grain milling, and chemical production are primary factors used in determining Buffalo's Level IV Classification.

(2) Water Quality - The New York State (NYS) Water Classification System is based on potential use of the water, with consideration given to existing land use practices. The Buffalo River within this project - including the Buffalo Ship Canal - is classified as Class "D" water. The north and south entrance channels of the harbor are Class "C" water and the outer harbor is classified as "B" water. Water in Lake Erie adjacent to the project is classified "A Special." "Special" indicating that the waters are used as an International Boundary according to the U. S. and Canadian Treaty of 1909. A further description of Classifications A, B, C, and D are provided below:

<u>Class</u>	<u>Best Usage</u>
A	Source of water supply for drinking, culinary, or food processing purposes, and any other usages.
B	Primary contact recreation and any other uses except as a source of water supply for drinking, culinary, or food processing purposes.
C	Suitable for fishing and all other uses except as a source of water supply for drinking, culinary or food processing purposes, and primary contact recreation.
D	These waters are suitable for secondary contact recreation, but due to such natural conditions as intermittency of flow, water conditions are not conducive to propagation of game fishery or streambed conditions. The waters will not support the propagation of fish.

(Title 6, Official Compilation of Codes, Rules, and Regulations of the State of New York, Chapter X, Division of Water resources).

(3) Wetlands - Wetland acreage within the Buffalo Harbor and River Area is limited to a few small, sparse, isolated pockets. Development of the shoreline with piers, bulkheads, and industry has all but eliminated wetlands from the project area. However, one notable area - Times Beach, a 46-acre site located adjacent to the Coast Guard Station on the Outer Harbor - is characterized by wetland plant species as cattails, sedges, rushes, and rice cut grass. This area is a partially filled, semiopen water, abandoned dredged disposal area that has been left to natural plant succession. The

area is set off and enclosed by a dike and is not directly open to the harbor.

(4) Vegetation - The highly commercial and industrial nature of the Buffalo River and harbor area have effected the aquatic vegetation of the area. A variety of aquatic vegetation including water celery, water millfoil, water stargrass, waterweed, and other pondweeds can still be found throughout the area. The commercialization of the area also limited terrestrial vegetation to usually narrow strips of riparian vegetation, which is composed of various trees and shrubs of the Salix genus (willow), sumac, aspen, boxelder, dogwood, and numerous common herbaceous forbs and grasses. There are, however, three areas within the project locale that are unique in that they represent a relatively large diversity of common vegetation native to the area, located within a highly industrialized city. These areas are the Tift Farm, located off Route 5; Times Beach, adjacent to the Coast Guard Station; and a field of approximately 40 acres adjacent to the Buffalo River at the foot of Smith Street.

(5) Fishery - The fishery of the area is comprised of two main assemblages - with some overlap - utilizing the study area. Lake resident fish that seasonally migrate into the river and harbor, and permanent resident fish of the river and harbor.

The fishery of the Buffalo River is comprised mainly of carp, suckers, bullheads, goldfish, some panfish (e.g., pumpkin seeds), and some forage fish such as spotted and emerald shiners. High summer temperatures, low populations of aquatic and riparian vegetation, combined with high levels of pollution, low oxygen, and continual disturbances from yearly maintenance dredging and commercial ship traffic, severely limit fish spawning and reproductive success within the Buffalo River. This limited success of adult fish reproduction was shown in the results of ichthyoplankton samples - (newly hatched fish) taken by SUNY at Brockport 1981 during a biological survey of the Buffalo Harbor and River area. Samples indicated extremely low to no ichthyoplankton present in the Buffalo River and yet some captured adult fish were in ripe spawning condition.

The Buffalo Harbor area shows improved water quality, increased substrate diversity, lower turbidity, and better oxygenation than the Buffalo River, and this is reflected accordingly in the fish population. Annual fish residents include yellow perch, rock bass, centrarchids, and some small mouth and large mouth bass. In addition, seasonal residents include game fish such as occasional salmonids, pike, walleye, and muskellunge. The aforementioned improved physical conditions are also reflected in an increase of ichthyoplankton recorded by the SUNY at Brockport studies in the Buffalo Harbor area, further indicating an improvement of fish habitat and reproductive success over the Buffalo River.

(6) Wildlife - Terrestrial habitat within the Buffalo Harbor and River area is greatly reduced and altered by commercial and industrial development. There are a few isolated areas such as Times Beach, Tift Farm, and some open field areas along the Buffalo River, that support populations of pheasants, rabbits, passerine birds, and some nesting waterfowl and various species of

rodents. However, the Outer Harbor area is extensively utilized throughout the year by shorebirds, gulls, and waterfowl for feeding and nesting. The breakwalls located within Buffalo Harbor are a component of the existing Federal project. Two of these breakwalls - the north breakwall (Donnelly's Pier) and the smaller breakwall located southwest of the north breakwall - are used by common terns, herring gulls, and ring-billed gulls for nesting (FWS: 1980), also, these two areas are noted for their muskellunge and walleye fishing.

A recent survey of the Buffalo Harbor and River area indicated that few species of amphibians and reptiles were found. Species included, leopard frogs, snapping turtles, painted turtle, and garter snakes (SUNY Brockport: 1982).

(7) Endangered Species - Under Section 7 of the Endangered Species Act of 1973, consultation with U. S. Fish and Wildlife was instituted on 11 August 1980. Fish and Wildlife Service responded by indicating that except for occasional transient individuals, no Federally listed or proposed endangered species under their jurisdiction are known to exist in the study area. Also, a biological survey of the Buffalo Harbor and River area (1982) showed no New York State protected or endangered plant or resident animal species present within the proposed project area. However, personnel from SUNY Brockport, while performing biological field studies for the Buffalo District on 9 October 1981 and again on 8 November 1981, observed a peregrine falcon (Falco peregrinus) in the vicinity of an abandoned concrete grain elevator adjacent to the foot of Smith Street, Buffalo, NY. The falcon was observed stooping on a hooded merganser on 8 November 1981. The field crew did not find evidence of roosting in the area, but did notice the disappearance of resident house sparrows and starlings during the summer sampling periods from the grain elevator and adjacent open field.

(8) Wild and Scenic Rivers - In accordance with the National Wild and Scenic Rivers Act, Public Law 90-542, the final list of rivers identified as meeting the criteria for eligibility dated January 1981 was consulted. The Buffalo River is not classified as wild or scenic.

(9) Prime and Unique Farmlands - There are no lands designated Prime or Unique within the Buffalo Harbor project area, Erie County, NY.

(10) Benthos - Surveys in 1970 showed the Buffalo River benthic population to be mainly comprised of the order Pleisophora (sic) with sludge worms being the dominant form present. However, observations made in 1972 showed an increase in variety with nematodes and leeches being present. These species are more typical of less polluted environments than the forms found in previous years (Sweeny and Merckel: 1972).

A 1977 benthic study of Buffalo Harbor showed the family Chironomidae was the most diverse group followed by Tubificidae and Gastropoda. However, the most frequently occurring species was the snail Valvata tricarinata which accounted for approximately 14 percent of the total population within the area studied. This species was followed by the sludge worm, Limnodrilus hoffmeisteri and the clam Pisidium sp., and the bloodworm Procladius sp.

which make up approximately 7 percent of the population. This data and previous work done by Great Lakes Lab (1975) indicated that there were no rare and endangered species present. There were some (species) though, that were uncommon to eastern Lake Erie. In general, the surveys indicated a benthic community typical for the existing depths and sediment types present. (Great Lakes Laboratory: 1979).

c. Human Environment.

Under the heading Human Environment, the description of existing conditions and the evaluation of the potential environmental impacts of the various alternatives will be limited to the Buffalo SMSA (Standard Metropolitan Statistical Area) which is composed of Erie and Niagara Counties. In the Reconnaissance Report, the Buffalo Economic Area (BEA), defined by the Bureau of Economic Analysis which includes eight counties in New York and Pennsylvania was also used in the discussion of social and economic elements. The BEA has been eliminated from this stage in order to focus in on the area of primary impacts of the various alternatives proposed. Where the information is relevant and available, data is summarized for Erie County, the city of Buffalo, and the project area. The Community Development Corporation District 12, 1976 report is used to characterize the residential areas closest to the project area.

(1) Population - During the 1970's, the pattern of change in Erie and Niagara Counties, Buffalo Standard Statistical Metropolitan Area (SMSA), was similar to that of other metropolitan areas in the U. S. Population in the major cities declined while smaller communities increased. The State of New York as a whole also showed a decrease (-3.8 percent) as did Erie and Niagara Counties, (-7.9) while smaller New York State communities and unincorporated areas increased in population. The Buffalo SMSA decline was the second largest of any SMSA in New York State. Among cities in the United States, the city of Buffalo, with a population of 462,800, ranked 28th in 1970. By 1980 the city ranked 37th in the nation.

Population densities for the State, SMSA, counties and cities are declining as might be expected with outmigration and population loss.

Erie County had 263,944 families and 365,217 households according to 1980 Census data. The County's population is broken down into 532,234 females with a median age of 33.4, and 483,238 males with a median age of 30.0. About 12 percent of Erie's population is age 65 or over. Approximately 27 percent of the county's population is 17 years old or under.

The city of Buffalo with a 1980 population of 357,870, contains 29 percent of the total population of the metropolitan area. This represents a 22.7 percent decrease since the 1970 census. The median age for the 192,815 females in the city was 33.0 in 1980 and 29.0 for the 165,055 males (see Table 2).

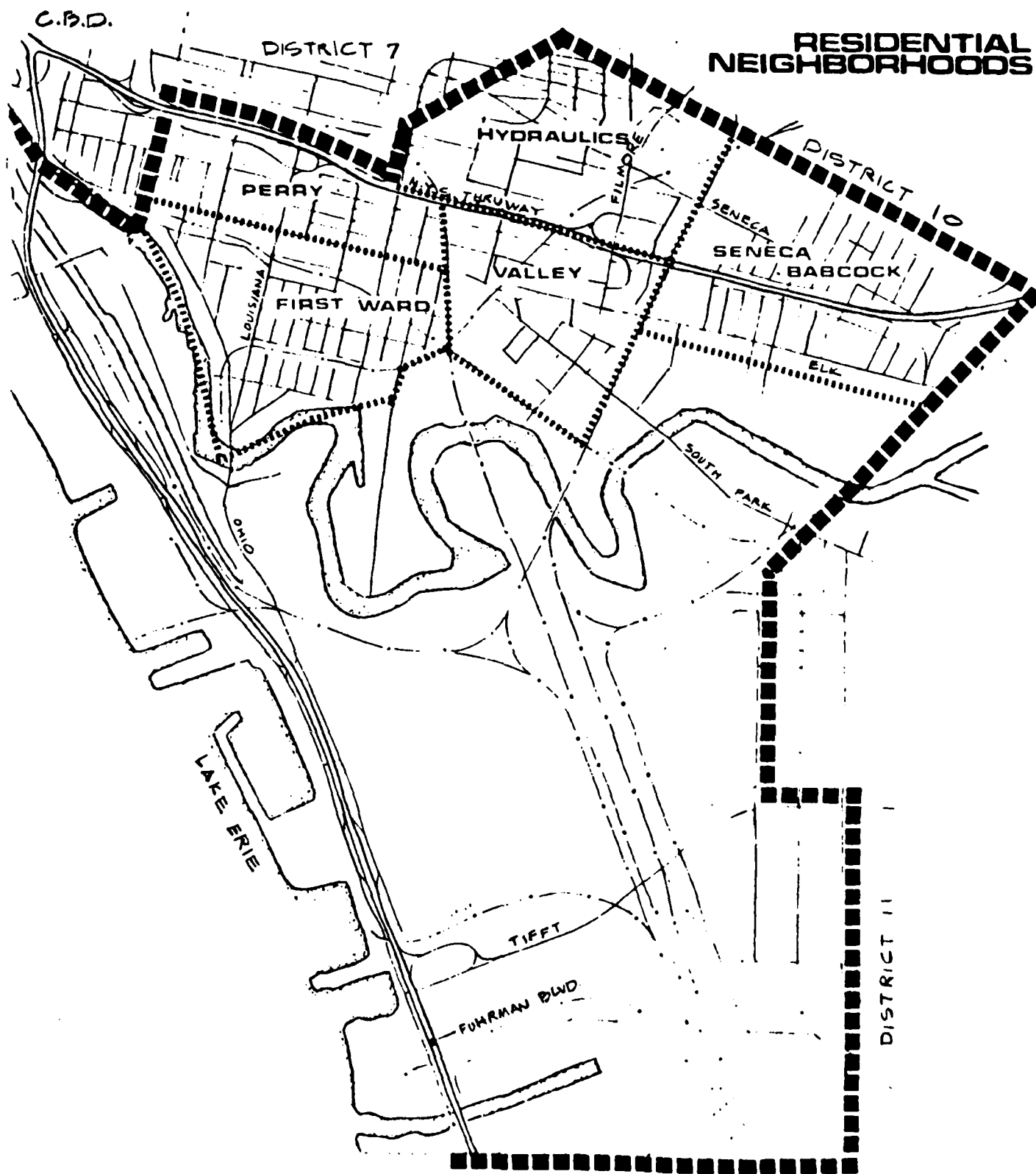
District 12, also known as the Buffalo River Community (see Figure 4) is a Community Development Corporation area. This District includes the residential neighborhoods Perry, First Ward, Hydraulics, and Seneca-Babcock. The following is a summary of comments on the District's population in the 1976

Table 2 - Population Characteristics

	Erie County		Niagara County		SMSA		C.O.B.	
	1973	1980	1973	1980	1973	1980	1973	1980
Families	:	263,944	:	60,621	:	324,565	:	:
Households	346,374	365,217	71,881	80,258	418,255	445,475	157,951	:
Females	580,387*	532,234	120,951	117,716	701,338	649,950	247,168*	192,815
Median Age:	30.5*	33.4	30.12*	32.4	30.31	32.9	30.8*	33.0
Males	533,104*	483,238	114,769	109,638	647,873	592,876	215,600*	165,055
Median Age:	29.9*	30.0	27.45	29.8	28,675	29.9	28.0*	29.0
Percent of	:	:	:	:	:	:	:	:
Popula-	:	:	:	:	:	:	:	:
tion 65	:	:	:	:	:	:	:	:
or over	10.1	12.0	9.4	+12 (Percent):	10.0	:	13.3	12.3
Percent of	:	:	:	:	:	:	:	:
Popula-	:	:	:	:	:	:	:	:
tion 17	:	:	:	:	:	:	:	:
or Under	34.2	27.0	35.5	+28 (Percent):	34.4	:	30.8	26.8
Population/	:	:	:	:	:	:	:	:
Household	3.15	2.72	3.23	:	3.16	:	2.84	:
Total Popu-	:	:	:	:	:	:	:	:
lation	1,113,491*	1,015,472	235,720*	227,354	1,349,211*	1,242,826	462,768*	357,870
Percent	:	:	:	:	:	:	:	:
Non-White	9.6*	12.0	5.0*	6.2	8.8*	11.0	21.3*	29.5

* - 1970 Data

SOURCE: Buffalo Metropolitan Area Compendium of Market Data, Buffalo Area Chamber of Commerce - November 1981.



SOURCE: District 12 Buffalo River
Community Development Plan, City
of Buffalo, Department of Community
Development, New York, 1976

report, DISTRICT 12 BUFFALO RIVER COMMUNITY DEVELOPMENT PLAN prepared for the Buffalo River Community and the Department of Community Development prepared by the Saratoga Associates, Buffalo, NY, July 1976.

As of 1976, the District has 12,200 people (3 percent of the city) which represents a 21 percent rate of decline since 1960. This rate of decline was roughly even among the neighborhoods in the District and was considerably higher than the 13 percent city-wide rate of decline.

There is a large percentage of young people and a smaller percentage of elderly than for the city as a whole. Those under 18 years of age (39 percent of the District compared to 31 percent for the city) are concentrated in Perry and the First Ward. Those 65 or over (11 percent compared to 13 percent for the city) are concentrated in Hydraulics.

There are about 3.1 persons per household compared to 2.8 for the city. The percentage of husband and wife families is below the city average.

"The dynamic element in Buffalo's population trend of recent years has been net out-migration or the movement of substantial numbers of people out of this area. Were it not for these losses, largely young adults and their families, the excesses of births over deaths would generate growth of about half of 1 percent per year. The reason for the net out-migration is the lack of new job opportunities in the Buffalo job market." THE OUTLOOK FOR BUFFALO AND THE METROPOLITAN AREA. Buffalo and Erie County Economic Development Committee, 1976.

The SMSA has a wide variety of ethnic and racial groups. For 1980, the Census category "Race Distribution" shows 11 percent of the Buffalo SMSA, 29.5 percent of the city of Buffalo, 6.2 percent of Niagara County, and 12 percent of Erie County population falling under the category "Non-White." In both counties and the city of Buffalo, the Black population has been steadily increasing from 1950-1970. Blacks represent the largest minority group with 9.2 percent of the SMSA's population and the largest proportion of the Black population in the city of Buffalo at 26.6 percent (see Table 3 and Figure 5). District 12 reports a racial composition that is about the same as the rest of the city and notes that the Perry neighborhood is one-half people of color and one-half white people.

More than 60 percent of the population is composed of residents of foreign birth or parentage from the countries of Italy, Poland, Germany, and Canada. Poles made up the largest ethnic group in 1960 and 1970 for Erie-Niagara Counties and the city of Buffalo. Polish is the most frequently reported spoken language other than English. Italians make up the second largest grouping with people of Canadian and German descent the next largest groups.

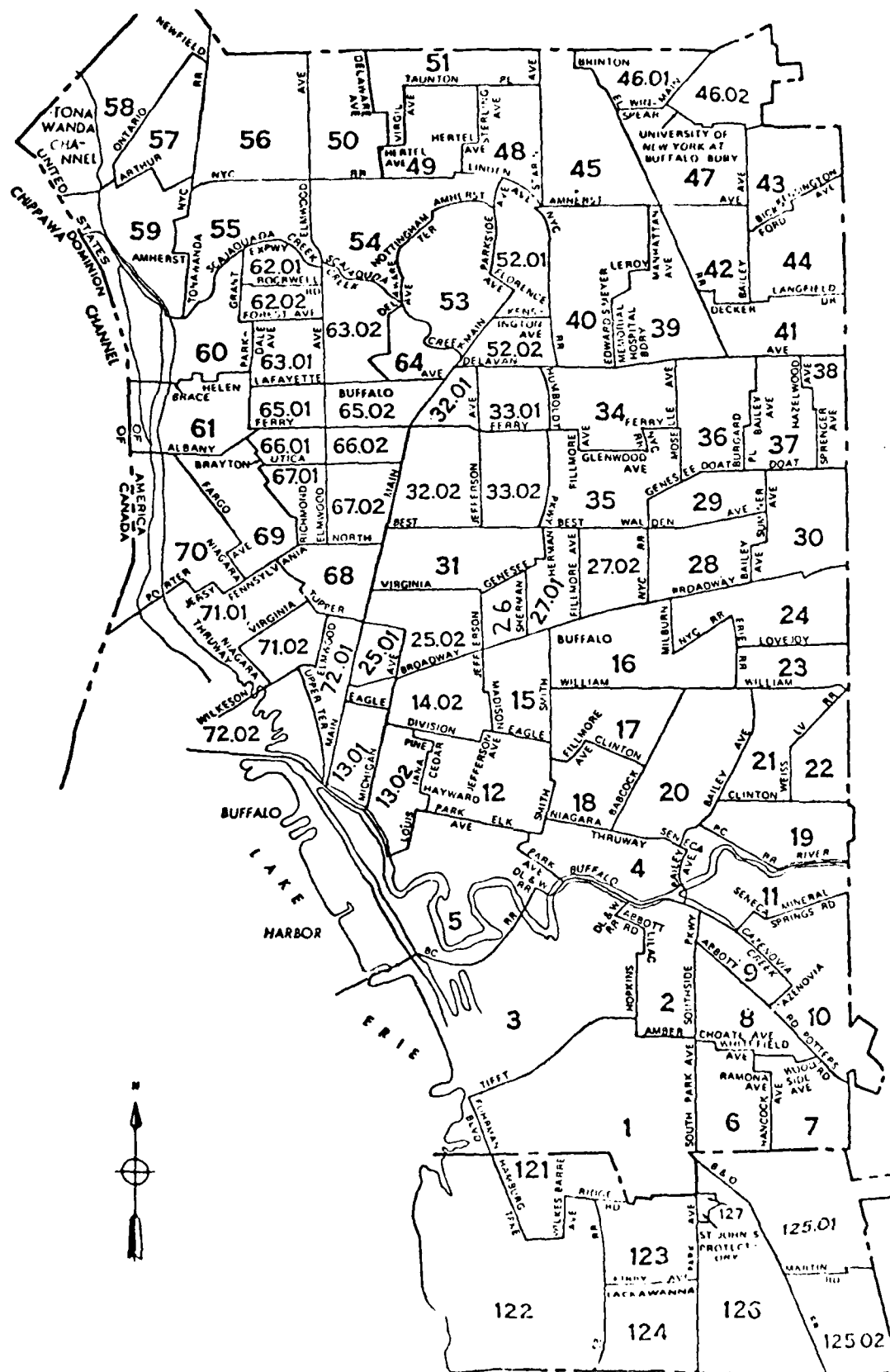
The latest available statistics on mobility in the area are from the Research and Marketing Services, Buffalo Area Chamber of Commerce 8/75; Source: U. S. Bureau of the Census and can serve as an example:

"About 41.1 percent of the 425,716 persons 5 years and over in the city moved between 1965 and 1970. Of these movers, 72.7 percent moved within the same

Table 3 - Population by Race

Tract	Total	White	Black	Indian	Asian	Other	In Addition to Total Hispanic(1)
Buffalo SMSA	1,242,573	1,106,075	113,915	7,133	5,910	9,480	16,206
Erie County	1,015,472	893,195	102,947	5,064	5,424	8,842	14,390
Niagara County							
Buffalo City	357,870	252,365	95,116	2,383	1,322	6,684	9,499
1.00	2,637	2,476	18	10	3	130	236
2.00	5,262	5,115	29	16	9	93	233
3.00	980	824	70	14	0	72	102
4.00	685	671	1	9	0	4	27
5.00	3,187	3,025	38	15	1	108	239
13.01	134	68	62	2	0	2	6
13.02	1,418	198	1,035	6	3	176	218
71.01	6,401	2,700	1,783	241	14	1,663	1,935
71.02	3,243	1,631	954	80	31	547	649
72.01	929	474	425	12	2	16	22
72.02	815	783	28	2	1	1	3

(1) There has been a coding change during the 1980 Census. The Hispanic population who gave their race as "Other" during the 1970 Census were recorded as White. However, during the 1980 Census, no such recording took place, therefore, a decline in the proportion of White population may be due to this coding change as well as a decline in the number of Whites.



CITY OF BUFFALO - CENSUS TRACTS

SOURCE: Buffalo Metropolitan Area Compendium of Market Data, Buffalo Area Chamber of Commerce, 1982

county, and 7.3 percent moved from a different county within the State. The remainder of the movers came from States other than New York. Of the 12,495 persons who moved to Buffalo during the past 5 years from other States, 23.5 percent came from northeastern States, 21.6 percent from northcentral States, 41.3 percent from southern States, and 13.5 percent from the western States."

(2) Land Use - The two county SMSA includes almost all forms of land use.

"On a regional basis, the largest use of land is for agricultural purposes which comprises 45.9 percent of land resources. This is followed by forested/brushland (32.1 percent), residential (10.4 percent), wetland (2.2 percent), industry (2.0 percent) and outdoor recreation (1.8 percent). The remaining (5.6 percent) land use is composed of public/semipublic, transportation, vacant, commercial and water."

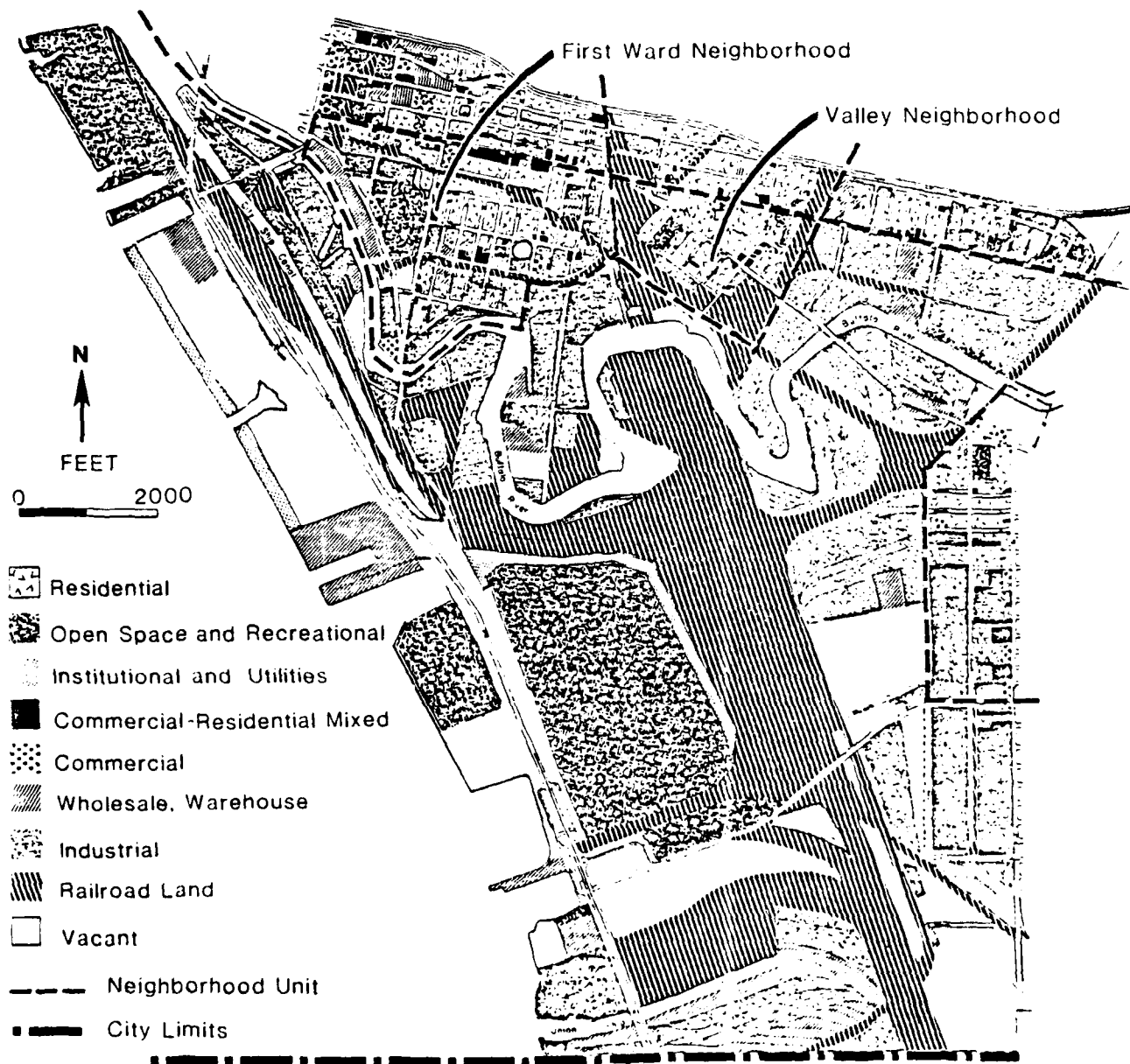
The largest percentage of land use in Erie County is forested/brushland (39.5 percent) followed by agricultural (36.2 percent), residential (12.6 percent), industry (2.2 percent), outdoor recreation (2.0 percent), and wetland (1.9 percent). The remaining (5.6 percent) land use is used for transportation, public/semipublic, commercial, vacant, and water. (Erie and Niagara Counties' Regional Planning Board, Report 6, (LAND USE PRESENT AND FUTURE), October 1980.)

"Except for a few scattered small urban communities, such as Batavia, Ithaca, Lockport, East Aurora, Arcade, Springville and Gowanda, nearly all the urban land lies within the city of Buffalo and the towns which surround the city in a circular manner. Concentrations of industrial land are located in the city of Buffalo near the Buffalo Harbor, southward from Buffalo along Lake Erie and along the Niagara River in Tonawanda." (Buffalo Metro Study, 1979).

"The city (Buffalo) is small in size compared to the central cities of comparable urbanized areas." (Buffalo Division of Planning, 1977).

The Buffalo harborfront area is characterized mostly by a mix of vacant and industrial land (Figure 6). The largest single land parcel is owned by the NFTA and is used for dry bulk and general cargo storage. Recreational use is represented by LaSalle Park and the Erie Basin Marina at the north end of the study area, and by the Tifft Farm Nature Preserve at the south end. Two small-boat marinas are also located in the area. With the exception of a housing project adjacent to the Erie Basin Marina, there is no existing residential development in the harborfront area.

The 700 acres of vacant tracts in the harbor area result largely from urban renewal and clearance efforts in the 1950's and 1960's. Much of the cleared land had been used by industry and port-related activities that lost their competitive edge during the course of this century and often left the area. Of those industries that remain in the harbor area; steel production, grain milling, related food processing, and the port are the most significant industrial activities that remain in the harbor area. However, the economic vitality of some of these activities is reaching its limit.



SOURCE: City of Buffalo

FIGURE 6: STUDY AREA VICINITY EXISTING LAND USE

The historic decline in harborfront activity parallels the general decline in the Buffalo area's economic health. The city of Buffalo has experienced a net loss of employment and population in the last decade.

At present, approximately all land bordering on the Buffalo River is zoned for industrial uses. In terms of industrial applications, the Buffalo River is drastically underutilized and likely represents the greatest water based area open to development.

District 12 (Figure 4) represents a larger land area encompassing 4,180 acres or 15 percent of the city land area. Residential areas, only 5 percent of the District land area, are isolated from each other by railroads and highways. These areas are among the oldest neighborhoods in the city and have a population density of 70 person/acre which is higher than the city average of 53 people/acre.

Seventeen percent of the District 12 land is vacant or undeveloped. The grain, steel, and shipping industries in the area seem on the decline and abandoned buildings from these and other closed industries pose safety hazards. The lake and riverfront represent an untapped resource, to which access is poor from District resident areas. Twenty percent of the District 12 land is devoted to rail lines which divide the community into residential or industrial sections.

An example of inappropriate land use is the location of nonwater-related industries on waterfront sites. The waterfront is the focal point of redevelopment efforts, but waterfront sites are relatively limited because of the presence of commercial, light industry, trucking, and storage facilities. Although these facilities were rationally located, in the sense that they were placed near the larger industries that they served, their occupancy of waterfront sites represents an underutilization of the resource.

An example of noncompatible use is the location of the Valley District residential neighborhood close to heavy industry. Valley District, which is east of the Ward 1 neighborhood, is located between heavy industry sites and a large commercial area. This promotes the movement of industrial and commercial traffic through a residential neighborhood.

For more details on various types of land use in the project area, see the appropriate parameter, e.g., transportation, recreation, etc.

(3) Agriculture and Farm Displacement - In New York, from 1974 Census of Agriculture to the 1978 Census of Agriculture, the total number of farms increased and the acreage of land in farms increased. The average size of a farm declined from 215 to 201 acres, and the percent of land area in farms rose from 30.7 to 32.4.

In Erie County, the number of farms decreased from 1,487 in 1974 to 1,398 in 1978 as did the acreage from 212,035 in 1974 to 202,804 in 1978. The size of farms in Erie increased slightly from 143 to 145 acres per farm. 31.3 percent of the land area was in agriculture in 1974, and in 1978 (released 1980) 30.0 percent. Niagara County's farms in 1974 numbered 1,228 with 155,835

acres in farms or 45.8 percent of the land area with an average farm size of 127. In 1978, there were 1,129 farms occupying 158,720 acres or 46.6 percent of the land area and averaging 141 acres/farm (see Table 4).

The major crop in the SMSA is corn for grain and silage. Dairying is particularly important in Erie County. Farm laborers and proprietors incomes have been increasing since a drop in 1976. The number of farm proprietors in the SMSA is generally declining (from 1970-1979). However, the Erie County pattern is somewhat different from the national, long-term trend, fewer and fewer farms. Erie County farm ownership, though fluctuating, is now close to the 1971 level. Farm employment has generally risen to a high of 2,658 in the SMSA and 1,607 in Erie County.

Table 4 - Agricultural Characteristics, Buffalo SMSA and BEA Area
1969, 1974

County/State	Number of Farms		Land in Farms (Acres)		Average Size of Farm (Acres)		Market Value of 1979 (In Thousands Dollars)		Average Value Per Farm (1979 Dollars)	
	1969	1974	1969	1974	1969	1974	1969	1974	1969	1974
Erie, NY	1,680	1,487	222,215	212,035	132	143	54,511	67,571	32,446	45,442
Niagara, NY	1,654	1,228	171,937	155,835	104	127	31,543	38,509	19,069	31,359
Primary Service:										
Area (Buffalo SMSA)	3,334	2,715	394,152	367,870	118	135	86,054	106,080	25,758	38,400

SOURCE: 1974 Census of Agriculture, New York and Pennsylvania, U.S. Department of Commerce, Bureau of the Census, Washington, DC, Issued June 1980.

There were 17 active agricultural districts in the SMSA in 1978 with a total of 185,217 acres with 128,500 in Erie County.

"The purpose of these agricultural districts is to encourage the continuance of a strong agricultural industry in the face of growing urban pressures and speculation. These districts seek to achieve this goal by: (1) offering farmers an opportunity to protect themselves from some of the rising costs and governmental actions usually associated with urbanization and by, (2) providing discouragements to residential, industrial, and commercial development within good farm areas.

"This process became law in 1971 and in 1972, there were two Districts formed. Agricultural districts have a life of 8 years, therefore, those formed in 1972 will come up for review/modification/recertification by 1979/1980."

(ERIE AND NIAGARA COUNTIES REGIONAL PLANNING BOARD'S 208 AREAWIDE WASTE TREATMENT MANAGEMENT STUDY REPORT NUMBER 4: ENVIRONMENTAL INVENTORY.)

According to the report cited above, there are no Prime Viable Farmlands or existing or proposed Agricultural Districts in the project area. Nor are there Prime and Unique Farmlands within the Buffalo Harbor project area.

(4) Business and Industry - The economy of the two-county SMSA is built on steel, grain, automotive, transportation, and power with a diversity of manufacturing operations. Niagara Falls is a leading center of the nations metallurgical industry and an important producer of chemicals and abrasives. Buffalo is also an important area for research with approximately 11,000 persons employed by about 150 research laboratories in the area.

In 1977, there were 1,712 manufacturing establishments in the Buffalo SMSA, employing 140,600 workers. The value (expressed in 1979 dollars) of manufacturing shipments in the SMSA totaled \$12.1 billion in 1977, an increase of more than 14 percent from 1972. Value added by manufacture in the SMSA totaled 5.4 billion. New capital expenditures in 1977 totaled \$546.3 million in the SMSA.

The major industry groups in the SMSA in 1977 were food and kindred products Standard Industrial Classification (SIC 20), printing and publishing (SIC 27), chemicals and allied products (SIC 28), stone, clay and glass products, (SIC 32) fabricated metal products (SIC 34), machinery, except electrical (SIC 35), and miscellaneous manufacturing industries (SIC 39).

The Buffalo SMSA contained 9,845 retail establishments in 1977 with retail sales of \$4.5 billion. Two thousand and sixty-six wholesale trade establishments were located in the SMSA in 1977. Wholesale sales for the SMSA accounted for \$8.1 billion in that year.

In 1977, 8,841 selected services establishments (hotels, professional offices, laundries, advertising agencies, data processing, repair shops, etc.) accounted for \$977.8 million in sales.

Mining activities in the Buffalo Harbor SMSA are nominal. Value of mineral production (expressed in 1979 dollars) in Erie County in 1975 was \$17.4 million and \$18.3 million in 1976. In order of value, the commodities were stone, lime, sand, and gravel, natural gas and clays. In 1976, these figures were withheld to avoid disclosure. The 1972 Census of Mineral Industries lists only 19 companies with mining activities in the Buffalo SMSA.

For more information on the business and industry profile of the Buffalo SMSA, refer to Table D2 in the Buffalo Drift and Debris Removal Study: Appendix D, ENVIRONMENTAL ASSESSMENT. For Erie County business and industrial data, refer to Table 5.

Table 5 - 1977 City County Data Book - Families, Income,
and Housing Profile

	1954	1958	1963	1967	1972
<u>Manufacturing</u>					
Establishments	1,529:	1,513:	1,496:	1,416:	1,342
Payroll (\$000)	679,214:	698,702:	833,750:	1,009,100:	1,292,300
Value Add (\$000)	1,213,897:	1,237,463:	1,516,106:	1,986,500:	2,251,000
New Capital Expense (\$000)	109,034:	66,050:	87,522:	151,400:	191,000
Employees	148,247:	128,476:	124,025:	134,100:	191,900
Production Workers:	114,180:	91,942:	92,085:	100,200:	84,700
<u>Retail Trade</u>					
Establishments	10,118:	10,875:	9,425:	9,249:	8,917
Sales (\$000)	1,108,668:	1,260,988:	1,402,688:	1,717,947:	2,346,418
Payroll (\$000)	135,050:	148,864:	167,337:	211,904:	299,783
Employees	54,071:	54,830:	53,546:	57,246:	67,049
<u>Selected Services</u>					
Establishments	4,148:	5,425:	5,514:	6,010:	7,313
Receipts (\$000)	155,225:	186,073:	227,990:	286,615:	528,622
Payroll (\$000)	46,559:	54,047:	72,867:	90,661:	175,741
Employees	16,153:	17,141:	18,891:	20,261:	28,620
<u>Wholesale Trade</u>					
Establishments	1,639:	1,778:	1,862:	1,791:	1,958
Sales (\$000)	1,900,419:	2,258,183:	2,774,651:	3,053,594:	4,082,400
Payroll (\$000)	95,318:	105,530:	122,350:	152,903:	216,852
Employees	20,474:	20,914:	20,060:	22,282:	22,985
<u>Mineral Industries</u>					
Establishments		27:	21:	27:	14
Payroll		2,362:	3,899:	3,700:	2,600
Ship Value (\$000)	6,127:	7,510:	7,481:	9,700:	7,300
Value Add (\$000)			4,975:		5,800
Capital Expense (\$000)				1,071:	
Employees		367:	532:	500:	200

SOURCE: SEEDIS (Socio-Economic Environmental Data Information System).
Lawrence Berkeley Laboratories, Berkeley, CA.

In the harbor area, much of the waterfront has been abandoned. Of the industries that remain, grain milling, related food processing, steel, and the port are the most significant. For a complete listing of business and industry in Buffalo Harbor, see BUFFALO HARBORFRONT, PROPERTY OWNERSHIP INVENTORY, Waterfront Redevelopment Component, Air Quality Technical Assistance Demonstration Program, and the C.O.B. Department of Community Development, Division of Planning, Buffalo, NY, December 1979.

Waterborne Commerce for Buffalo Harbor, in terms of tonnage, has fluctuated during recent years. Tonnage in the harbor decreased 34.1 percent in 10 years, from 13.8 million tons in 1968 to 9.1 million tons in 1978. Between these years, waterborne commerce reached a high of 14.1 million tons in 1969 and a low of 7.0 million in 1975. Iron ore and concentrates, limestone, and wheat, combined for nearly 80 percent of all movements on the harbor in 1978.

Vessel traffic in Buffalo Harbor fluctuated between 1957 and 1978 for both self-propelled and nonself-propelled vessels. Nonself-propelled vessels using Buffalo Harbor typically consist of petroleum tank barges. In 1978, the number of self-propelled vessels calling on the harbor was 899 and the number of nonself-propelled was 64 for a total of 963. Figures for total vessel traffic have ranged from a high of 1,563 in 1962 to a low of 733 in 1977.

(5) Labor Force, Employment, Earnings, and Income - According to a survey on ECONOMIC DEVELOPMENT IN THE ERIE-NIAGARA REGION done by the Steering Committee of the ENCRPB in June 1975:

"Erie and Niagara Counties' industrial firms surveyed report a labor complement consisting of about one-third each of skilled and unskilled workers and an additional 11 percent in supervisory and craftsmen category. Other personnel are 8 percent each for professional and clerical, 6 percent for managers and 3 percent each for sales and service workers.

"Buffalo industry has a higher proportion of unskilled workers and a lower share in the supervisory and professional and technical categories than industry in outlying areas.

"Sales and service workers comprise almost 50 percent of the workforce in commercial firms. Managers, skilled workers, unskilled workers, and clerical help represent between 9 and 11 percent each.

"Commercial labor complement varies somewhat between the two counties. There is a higher proportion of managerial and sales personnel in Erie County; in Niagara County, service workers are a larger share of total commercial employment.

"Clerical workers are the largest single occupational group (40 percent) reported by respondents in the government and professional category.

"Professional and technical workers represent 28 percent of employment and managers and administrators, 12 percent. The city of Buffalo has a substantially higher proportion of clerical workers employed in Government institutions and professional firms than the rest of the region. Outside the central city, the proportion of professional and technical workers is considerably higher; 53 percent compared to 16 percent in Buffalo.

"Skilled and unskilled workers are about half of the total employment (56,598) reported by the firms and institutions which provided labor force information in the survey."

The Buffalo SMSA accounted for 76.5 percent of both the labor force and number employed in the area in 1979. The decrease in the unemployment rate in the SMSA can be attributed to the dramatic increase in the number employed in Erie and Niagara Counties (43,000 between 1975 and 1979) and a less (see Table 6) substantial increase in the labor force (25,500) during the same period. However, estimates for May 1980 indicate the unemployment rate in the SMSA rose above 10 percent. A decline in manufacturing employment was primarily responsible for the decrease.

Table 6 - Annual Average Employment Characteristics by County and SMSA for the Buffalo Harbor Study Area (1975, 1979)

County/Stage	Civilian Labor Force		Number Employed		Number Unemployed		Unemployment Rate (Percent)	
	1975	1979	1975	1979	1975	1979	1975	1979
Erie, NY	456,000	475,600	407,000	440,000	48,700	34,800	10.74	7.0
Niagara, NY	99,700	105,600	88,600	97,800	11,000	7,800	11.1	7.4
Buffalo SMSA	555,700	581,200	495,600	538,600	59,700	42,600	10.9	7.3

SOURCE: New York State Department of Labor, Division of Research and Statistics, Albany, NY; and Pennsylvania Office of Employment, Security, Labor Market Information, Harrisburg, PA.

Manufacturing remains the mainstay of employment in the SMSA (see Table 7). In 1978, nearly 145,000 persons were employed in manufacturing, followed by trade and services, with 115,000 and 103,000, respectively. In May 1980, these figures had dropped to 133,000, for manufacturing, 113,000 for trade, and 100,000 for services. Almost all of the manufacturing industries showed a decrease. However, electrical machinery registered a large increase of 5.1 percent. The decrease in employment may be a part of a larger national trend toward higher unemployment rates.

Within the project area, the District 12 Report indicates that in 1976 only 30 percent of the population of the District was in the work force; the majority were unskilled laborers compared to 37 percent city-wide. The unemployment rate was also above the city average.

Table 7 - Nonagricultural Employment - Buffalo Standard Metropolitan
Statistical Area, 1978, 1979 Annual Averages and May 1979
and May 1980

Industry	Annual Averages			May		
	1978	1979	Percent	1979	1980	Percent
	(In Thousands)	(In Thousands)	Change	(In Thousands)	(In Thousands)	Change
Total	507.7	514.6	+1.4	517.6	508.8	-1.7
Construction	18.2	18.6	+2.2	19.0	19.5	+2.6
Transportation, Communi- cations and Public Utilities	28.0	28.5	+1.8	28.6	28.2	-1.4
Wholesale Trade	25.5	26.0	+2.0	25.8	25.8	0.0
Retail Trade	89.2	90.1	+1.0	90.5	90.7	-0.2
Finance, Insurance and Real Estate	21.6	22.0	+1.9	21.9	22.4	+2.3
Services, Mining and Miscellaneous	94.1	96.9	+3.0	97.3	99.7	+2.5
Government	87.1	86.9	-0.2	87.1	89.9	+3.2
Manufacturing	144.1	145.7	+1.1	147.5	132.7	-10.0
Durable Goods	98.2	99.7	+1.5	101.9	88.0	-13.6
Stone, Clay, and Glass Products	7.3	7.1	-2.7	7.2	6.7	-6.9
Primary Metals	20.8	21.6	+3.8	22.3	18.5	-17.0
Fabricated Metal Pro- ducts, Inc. Ordinance	14.7	13.9	-5.4	14.3	11.0	-23.1
Nonelectric Machinery	12.8	13.2	+3.1	13.3	13.4	+0.8
Electrical Machinery	11.2	11.6	+3.6	11.7	12.3	+5.1
Transportation Equip- ment	26.1	26.8	+2.7	27.6	20.3	-26.4
Other Durables	5.3	5.6	+5.7	5.6	5.8	+3.6
Nondurables	45.9	46.0	+0.2	45.6	44.7	-2.0
Food Products	9.3	9.2	-1.1	8.7	8.6	-1.1
Textiles and Apparel	3.8	3.7	-2.6	3.8	3.7	-2.6
Paper	4.2	4.2	0.0	4.1	4.2	+2.4
Printing and Publish- ing	8.6	8.8	+2.3	8.9	8.7	-2.2
Chemicals	9.6	9.4	-2.1	9.4	9.2	-2.1
Rubber and Plastic Products	5.9	5.8	-1.7	6.0	5.2	-13.3
Other Nondurables	4.7	4.9	+4.3	4.7	5.1	+8.5

NOTE: The Buffalo SMSA includes Erie and Niagara Counties.

SOURCE: U.S. Department of Labor and the New York State Department of
Commerce, Division of Economic Research and Statistics, 29 July 1980.

Earnings include wage and salary disbursements, commissions, tips, and proprietor's income. Between 1975 and 1978, earnings in the SMSA increased 7.1 percent. Per capita income in the SMSA rose from 7,549 in 1975 to 8,304 in 1978 - an increase of 10.0 percent.

Personal income includes not only wage and salary disbursements, commissions, tips and proprietors income but also dividends, interests, rent, and transfer payments. In the SMSA, the percentage of personal income increase was 6.7 percent from \$10.1 billion in 1975 to \$10.8 billion in 1978. In Erie County, total personal income rose from \$4,33,800,000 in 1970 to \$8,217,000,000 in 1978. The Personal Income Per Capita rose from \$4,032 in 1970 to \$7,706 in 1978.

For comparison purposes, the 1977 Estimated Per Capita Money Income in dollars was 5,751 for the United States, 5,849 for New York State, 5,590 for Erie County and 4,942 for the city of Buffalo.

In 1979, the Buffalo Metro Area Median Household Effective Buying Income was 17,326 compared with the same figure for 1980 at 19,118. The city of Buffalo's figure in 1979 was 13,731 and rose to 15,140 in 1980. (Source: Research and Marketing Department, Buffalo Area Chamber of Commerce.

In 1979, the effective buying income for the Buffalo Metro Area was \$9,196,155,000 and the Median Households Effective Buying Income was \$17,326 compared with the same figure for 1980 at \$19,113. The city of Buffalo's figure in 1979 was 13,731 and rose to 15,140 in 1980. (SOURCE: Research and Marketing Department, Buffalo Area Chamber of Commerce.)

For Erie County, Table 8 gives data on Family Income and information on public assistance recipients and expenditures.

Table 8 - 1977 City County Data Book - Families, Income, and Housing Profile, Erie County, NY

	Family Income		
	1950	1960	1970
Number of Families	229,430	271,582	227,828
Percent Low Income (1)	16.3 Percent	12.6 Percent	7.2 Percent
Median Family Income (\$)	3,490	6,395	10,462
Public Assistance Recipients			
	1972	1976	
AFDC	54,372	51,595	
AFDC Children		35,657	
Average Mnothly Payments/Family (\$)	229	316	
SSI			
Total		19,476	
Aged		7,660	
Payments Total/Month (\$000)		2,563	

(1) Low income defined as under \$2,000 for 1950 and as under \$3,000 for 1960 and 1970.

(2) Items defined as median values are weighted average of medians.

SOURCE: Seedis (Socia-Economic Environmental Data Information System), Lawrence Berkeley Laboratories, Berkeley, CA, 1982.

In the residential areas of the Buffalo Harbor, the 1970 median income for families was \$5,785 compared to the cities median income of \$6,561. Twenty-six percent of the total population and 20 percent of the elderly live below the poverty level - again figures higher than for the rest of the city. Twenty-three percent of District 12's households are receiving some form of public assistance compared to city-wide average of 10 percent in 1976.

Single parent households (female headed) with children under 18 years of age make up 12 percent of District 12's population. These figures indicate that this residential area's population is sensitive and could be disproportionately effected by any impacts of the proposal project.

(6) Housing - New York State had 6,299,684 housing units in 1970 and 6,866,851 in 1980; a 9.0 percent change over the 10-year period. The total number of housing units in the two-county area has risen steadily since 1940 although there was a dropoff in construction between 1960 and 1970. Erie County (see Table 9) had 360,893 units in 1970 and 389,039 in 1980, showing a 7.8 percent increase and lagging behind the State's increase. Niagara County had 85,037 housing units according to ADVANCE REPORTS OF THE 1980 CENSUS OF POPULATION AND HOUSING FOR NEW YORK. This represents 13.8 percent increase for Niagara County from 1970 figures. These increases, however show growth in the municipalities surrounding the metropolitan areas of Niagara Falls and Buffalo. Buffalo actually had a negative growth rate of -5.8 percent (SEEDIS: 1982). The city has lost 9,672 housing units (from 166,142 to 156,470) between 1970 and 1980. The city of Niagara Falls grew just 2 percent, but the city of North Tonawanda, one of the surrounding municipalities, shows an increase of 20.2 percent. The percentage of owner-occupied units in the SMSA has risen steadily since 1940 and the mobility (percentage moved into in last 5 years) in 1970 was slightly above 40 percent. Median rent in 1960 was \$73 and \$81 for Erie and Niagara County, respectively. In 1970, it was \$99 and \$100.

The Buffalo River Community (see Figure 4) is one of Buffalo's oldest community areas and many residents of the area have a strong sense of historic and cultural ties (e.g., the First Ward which is historically an Irish neighborhood). However, there are also many problems in the area. Those related to housing and land use have been noted under existing Land Use. Others (noted in the CDC District 12 Report) include that: much of the housing is old (86 percent of the units were built before 1939), much of the housing is in substandard condition, home ownership and housing values are low, and vacancy rates are high and households overcrowded compared with statistics for the city as a whole.

The harbor area neighborhoods have undergone many changes during the past two decades. More multifamily dwellings have been built, resulting in a more transient population, and more land has been taken for transportation uses. Although the residents of these neighborhoods have many similar characteristics, community cohesion has been deteriorating for a number of years. Between 1960 and 1970, most of the neighborhoods along the waterfront lost population. Population losses in Ward 1 have been minimal, and it is probable that this area is more cohesive and stable than many other Buffalo neighborhoods.

This combination of housing problems and the pressures of contrasts in land use could make the residential areas around the project area sensitive to project impacts. Finally, some portions of the residential areas are located within the Buffalo River Floodplain which could make them especially sensitive to changes in the Buffalo River.

Table 9 - Erie County Housing

	Housing				
	1940	1950	1960	1970	1980
Total Housing Units	219,868	261,157	334,941	359,384	389,038
Percent Built Since Last Census		13.1 (Percent)	22.2 (Percent)	13.6 (Percent)	
Occupied Units	208,868	252,247	316,459	346,374	365,217
Owner Occupied	38.1 (Percent)	52.5 (Percent)	59.8 (Percent)	61.5 (Percent)	2.35/2.72
Median/Mean Occupants	3.4md	3.2md	3.4mn	3.2mn	
Median Value Owner Occupied (\$)			15,000	18,498	40,200
Median Rent (\$)			73	99	155
Mobility (Percent Moved Into in Last 5 Years)				42.8 (Percent)	
Construction (1975-1976)					
New Private Units Authorized				5,060	
Percent Single Units				74.1	
Percent 5+ Units				20.6	
Total Permit Value (\$000)				135,130	
Average Per Unit (\$/Unit)				26,705	

SOURCES: Seedis, LBL, Berkeley, CA, 1982.

(7) Property Values and Tax Revenues - Total assessed valuation in 1976 (expressed in 1979 dollars) for the SMSA was \$4.3 billion. Erie County alone accounted for approximately \$3.3 billion. The SMSA had revenues of \$7.1 billion. Erie County accounted for \$5.8 billion in revenues or 82 percent of the SMSA total. General expenditures and total dept outstanding for the SMSA were \$8.0 billion and \$4.9 billion, respectively.

Tax revenues for the Buffalo SMSA in 1977-1978 amounted to \$731.5 million (in 1979 dollars). Of this total, \$517.1 million were property taxes and \$173.2 million were general sales and gross receipts taxes. Other taxes amounted to \$41.2 million.

Several opinions have been expressed that the issue of harbor area taxation needs to be addressed if large-scale redevelopment efforts are to materialize. The harborfront represents 11 percent of the city's total land area, but provides only 5 percent of its total annual property tax.

Table 10 - Property Tax Generation Per Acre

Area	Total Acres	Annual Property Tax Dollars	Annual Tax (Dollars/Acre)
Harborfront Area	3,383	\$ 3,813,494	\$ 1,128/Acre
City of Buffalo	27,364	76,129,549	2,782/Acre

SOURCE: BUFFALO WATERFRONT, PROPERTY OWNERSHIP INVENTORY, Waterfront Redevelopment Component, Air Quality Technical Assistance Demonstration Program and the city of Buffalo, Department of Community Development, Division of Planning, Buffalo, NY, December, 1979.

Table 10 illustrates the striking differences in property tax generation per acre between the Harborfront Area and the city of Buffalo. The study from which this data was used cites three factors for this difference. They are:

1. The high concentration of tax exempt public-owned property;
2. The high concentration of unimproved and underimproved land;
3. The high concentration of railroad property

Railroad transportation-use property is exempt from 41 to 85 percent of the total assessed valuation. Property owned by railroads not used for transportation, is subject to taxation at the full assessed value. Site preparation planning for these lands and early purchase of divested property could ensure early return of these lands to economic productivity.

Table 11 gives a general picture of the city of Buffalo's finances as well as an indication of the city's revenue from property taxes.

Table 11 - City Finances - 000's Omitted

	FY	FY	FY	FY	FY	FY
	75-76	76-77	77-78	78-79	79-80	80-81
	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)
Revenues and Transfers (1)	190,419	198,972	190,309	186,184	203,840	205,117
Property Taxes	86,017	89,535	89,042	76,832	82,091	84,557
Other Revenue	104,402	109,437	101,267	109,352	121,749	120,560
Bond Proceeds (Long-Term Debt)	-0-	9,975	50	20,027	-0-	14,519
Expenditures, Encumbrances and Transfers (1)	181,269	184,531	186,629	185,812	194,265	200,368
Debt Service Expenditures (2)	32,292	30,337	28,887	29,552	29,540	26,523
Property Tax Generated Per Acre						
City - 27,364 Acres	3.14	3.27	3.25	2.80	2.99	3.09
Harborfront - 3,382 Acres	.38	.40	.40	.34	.36	.38

(1) Does not include Revenue and expenditures directly attributable to the Board of Education.

(2) Total Expenditures for General City and Enterprise Fund. Include both long and short-term Debt Service Expenditures.

(3) City of Buffalo fiscal year runs from July 1st to June 30th.

SOURCE: City of Buffalo, Department of Administration and Finance.

(8) Community Facilities and Services - As a major metropolitan area, the Buffalo SMSA is amply supplied with basic services: electricity from Niagara Mohawk Power Corporation and New York State Electric and Gas Corporation, heating from National Fuel Gas and the electric companies, telephone, water, and sewer, Police and Sheriff's Departments, volunteer and professional fire fighters, public and private schools, medical facilities, community centers, and parks and recreational areas.

Within the harbor area itself, the Buffalo River Improvement Corporation (BRIC) formed to connect area industries with the City Sewage Treatment

system. There is a Coast Guard station in the Outer Harbor and the EDWARD S. COTTER fireboat provides fire-fighting services for the harbor area.

City-wide, a major facilities and services problem is the aging water distribution system, which is currently being studied for feasible improvements.

Within District 12, problems related to community facilities and services were described as a general lack of health care services, a low level of programming in community facilities, and dependency on inadequate transportation.

(9) Recreation - The two county area, with Lake Erie to the west and Lake Ontario to the north, and the Niagara River connecting both lakes, provides a very wide range of seasonal recreation where water plays a key role (see Figure 7). Visitors to Niagara Falls make an important contribution to the region's economy. Most sports are within a reasonable drive from the region, and spectator sports are a very important part of the social life of the two counties. There are a number of stadiums, gardens, halls, libraries, and theatre. There are 13 State parks in the SMSA with Beaver Island, Buckhorn Island, and Evangola (all water-related) in Erie County.

As an urban center, the city of Buffalo also provides most recreational opportunities and facilities. According to the 1977 Buffalo City Plan, the Buffalo Zoo is the second largest tourist attraction in the Buffalo area. The area of most need in the city planning category of "parks, recreation, and open-space" is in neighborhood parks. Seventy percent of the city's total park inventory is made up of Delaware Park and the large parks which are on the perimeter of the city.

The 1970 Corps of Engineers INTERIM REPORT ON FEASIBILITY OF IMPROVING RECREATION ACCESS AND RELATED WATER AND LAND MANAGEMENT states that "Recreational resources are fairly well-distributed throughout the study area. However, realization of maximum use and benefit from the abundant recreation resources in the urban area has not occurred primarily because of problems relating to access."

The Community Development Corporation area, District 12 (see Figure 4), also reports that parks and playgrounds are generally well distributed among neighborhoods, but are poorly maintained and in need of rehabilitation. Major recreation centers in the District are not fully utilized by residents of other neighborhoods. Tifft Farm Nature Preserve is a regional resource that is located within the District. Because of its location in a highly urbanized area, the aesthetic value of this open-water, woodland, and marsh area is increased. Tifft Farm is seen as part of a larger ecosystem that cannot realize its full potential unless adjacent privately owned areas are brought under public control.

The project area itself includes recreational boating, fishing, and sport fishing areas, public water-oriented parks, water oriented scenic areas, tourist spots and etc.

Times Beach is a former dike disposal facility for dredged material. It's use was discontinued when it was realized that it had become a prime area for wildlife. It is located approximately 2 miles from downtown Buffalo, and it provides city dwellers with the opportunity to observe migrating water birds within the sheltered waters that provide them with a feeding and resting area.

In the project area there are very few places designed for swimming and boaters say that there are not enough docking and storage spaces for their recreational craft. City-owned water-oriented parks listed in the 1977 BUFFALO CITY PLAN are shown in Table 12.

Table 12 - Water Oriented Recreational Areas

Water Oriented	:	Acreage
George Washington Park	:	1.8
Ontario Boat Ramp, Drive	:	3.6
Broderick Park	:	3.4
LaSalle Park	:	56.3
Erie Basin Marina	:	35.2
Marine Drive Riverwalk	:	5.1
NFTA Small-Boat Harbor	:	65.6
Bennett Beach (In Evans)	:	<u>52.7</u>
Total	:	221.7

SOURCE: Division of Planning, City of Buffalo, 1977

The Riverwalk provides a public access trail along the Niagara River and affords linkages with recreational facilities, nearness to water, scenic vistas, and a safe (from falling or conflict with vehicles) walking, ski touring, or riding experience. Many feel that the expansion of this "greenbelt" should be encouraged.

Waterfront Village is a mixed-use residential, commercial, and recreational development that could influence the course of subsequent harbor area development. However, controversy has accompanied this revitalization effort, primarily with regard to the issue of whether sufficient public facilities have been incorporated. The site is the last lakefront property available for public use, and many groups claim that the Waterfront Village will not be accessible to the public.

The Naval Park offers waterfront access and exhibits the USS LITTLE ROCK and USS SULLIVAN'S. The NFTA small-boat harbor and Erie Basin Marina provide

access to Lake Erie in addition to fishing and boating facilities. Both are very popular and heavily used. Most of the remaining Outer Harbor lands are undeveloped or inaccessible for public use due to heavy industrial activities.

Three primary characteristics make the waterfront an important recreational resource: (1) proximity to a major urban area; (2) scenic qualities; and (3) the improving water quality, which is giving rise to an improving sport fishery resource.

Buffalo's waterfront is now being recognized as an underutilized natural resource with possibilities for bicycling, dockside and offshore fishing, ice skating, winter ski touring, jogging, swimming, waterfront dining, bird watching, walking, picnicking, and sledding.

However, waterfront accessibility is limited. The river is severely blocked by a band of highways (notably the New York State Thruway and Buffalo Skyway), railways, and industrial development (NFTA, and numerous nonwater-related riverfront companies). Recent developments have contributed significantly to the realization of these possibilities. Further developments in the direction established by Tiffet Farm, Riverwalk, and Waterfront Village are restricted by visual, air and water pollution, high noise levels, blocked or undeveloped access, and deteriorated and unmaintained facilities.

Recreational navigation presents a special problem. The extent of recreational boating along the Buffalo River and Outer Harbor is limited by a number of factors: problems of accessibility (pedestrian and vehicular access, boat launching ramps, etc.), and a lack of marina facilities (boat slips, boat storage areas, safety features, etc.).

For more detailed information on recreational boating, refer to the Economic Appendix.

(10) Aesthetics - Aesthetics refer to the perception of natural and man-made beauty and the judgement involved in deciding what is beautiful. The two-county area provides a wide variety of most aspects of aesthetics-urban and rural areas, new and old developments, noisy industrial areas and tranquil green spaces including a major scenic point of the U. S. - Niagara Falls.

The two-county region is characterized by variety. Within this area are so many different land uses, remains, and climatic conditions, that most could find scenes or experiences that appeal to their taste. Heavy industry, light industry, commercial areas, small towns, nightlife, green spaces, agricultural and non-agricultural lands, and suburbs are all included in this area. The terrain varies from the Boston Hills to the south through flatlands in the Buffalo area to the Niagara Escarpment, Lake Erie in the west and Ontario in the north and the Niagara Gorge in between. The seasonal climate includes cold sunny winters, hot dry summers, and mild spring and fall. Within the SMSA and the project area are also signs of growth, stability, and decay.

The Inner Harbor in Buffalo is dominated by industrial uses. Plants and mills are interspersed with abandoned facilities and areas which have reverted to natural plant succession. The Outer Harbor has large open spaces, Times Beach (containing both terrestrial and aquatic plants), storage areas for the Port of Buffalo, marinas, and waterfront residential and business developments.

The residential sections around the project area are generally small, isolated by railroads and highways, and blocked from the river by the industrial development. Parks and playgrounds may be poorly maintained, and industrial odors are a recurrent problem as is substandard housing. Somewhat offsetting these negative impacts on the aesthetics of the community are many examples of individual and group efforts at neighborhood beautification.

As aesthetic values depend on the receiver, there are most likely many different ideas of what the waterfront area should look like. These differences in aesthetic values are often reflected in the larger question of appropriate land use for the waterfront; something all recognize as a valuable resource. There are a wide variety of proposals for future land use including residential, industrial, and recreational, which are described in the 1981 Corps of Engineers BUFFALO HARBOR REVITALIZATION STUDY.

Another issue related to aesthetics is that of public access. THE NIAGARA RIVER ENVIRONMENTAL PLAN: SUMMARY REPORT, Erie and Niagara Regional Planning Board, June 1972 states that:

"In the city of Buffalo, the uses of the shore are oriented to the activities of the city's central business district. The New York State Thruway takes up much of the shoreline, acting as a wall between the river and the nearby large concentrations of urban population. "

Since this report was published, access to the waterfront has improved somewhat through developments like the completed portion of the Riverwalk and the Erie Basin Marina, but access is still widely acknowledged as an ongoing concern.

Drift and debris in the project area has collected along the shoreline over the years and created what could be considered an eyesore, and a sign of Buffalo's losses in its industrial base. The drift and debris sites vary from the skeleton of the Ganson Street Warehouse, to wooden docks all askew and crumbling into the river, to driftwood accumulating along the shorelines.

(11) Noise - Noise is sound without value that is unwanted and intrusive, (ER 1105-2-105, Information Supplement No. 1). The impacts of noise are affected by population density, income, and socioeconomic level. A recent study - "THE URBAN NOISE SURVEY" by Sanford Fidell of Bolt, Berenek, and Newman for USEPA Office of Noise Abatement and Control, August 1977, found that neighborhood satisfaction is inversely related to noise exposure. Annoyance caused by noise was found related to perceived reasonableness of the sound. Predictability, noise annoyance is more prevalent during the evening and night and higher among those bound to the noisy area. Urban

noise-caused annoyance was associated with vehicular traffic. Urban areas may have an ambient noise level of 70-80 decibels or more.

Principal sources of loud noise are construction activities, motor vehicles, aircraft, trains, and a wide assortment of power equipment, all of which are present in the Buffalo Harbor area. Peak noise levels for these kinds of activities generally range from 70 to 135 decibels.

On the shorelines, there are generally some buffer zones between residential and industrial uses, which ease noise impacts. However, along the Buffalo River, some residential areas are behind the industrial uses on the shoreline and may be subject to higher than average urban noise conditions.

(12) Community Cohesion and Control - Community cohesion is the unifying force of a group of people in a common area resulting from one or more characteristics which provide a commonality such as race, education, income, ethnicity, religion, language, social class, or mutual economic and social benefit. Community cohesion also refers to the inferred relationships among persons who have resided in a given area for a sufficient period of time to have established patterns of behavior with each other.

Desirable community growth is an increase in community population with a corresponding increase in community services and facilities. Community growth is desirable when it is consistent with stated community goals and values. Local plans indicate local desires.

The general area has been subject to outmigration over the past 10 years. Recently, there has been an increase in unemployment and some loss of retail manufacturing establishments. However, public sentiment in defense of the area is strong (perhaps related to the area's reputation on bad weather) which is exemplified by Buffalo's "Talking Proud" campaign.

The city of Buffalo's Community Development Corporation, District 12 Report, states that "The People of the Buffalo River Community on a mixture of long-term residents and area inner city immigrants - the latter mostly blacks, who are equally disadvantaged economically." Home ownership rates are low as are housing values. Vacancy rates are high. The district neighborhoods, however, surrounded though they may be by industry and railroad, represent some of the most cohesive, fiercely loyal social units in the entire city. This is a tremendous asset for community development purpose - and there is a desire on the part of many younger people to remain in this area where family roots and neighborhood social concern are strong."

The lower West Side (near LaSalle Park) is the most racially and ethnically mixed community in the city and surrounding areas.

The harbor area neighborhoods have undergone many changes during the last two decades. More multi-family dwellings have been built, and some land has been taken for transportation uses. The result has been a loss in population for most of the harbor neighborhoods. The few areas which have gained residents did so because of the construction of additional multifamily structures. Although the Ward 1 area has lost population, the losses have been minimal.

Any project which would disturb this area by causing the relocation of residents or the splitting of a neighborhood would adversely affect their cohesion.

(13) Institutional - The Reconnaissance Report noted that an initial survey of institutions indicates that there are approximately 25 regional and local agencies actively engaged in planning for the Buffalo waterfront. At least 40 additional agencies have important jurisdictions with respect to water resource management in the area. Moreover, there are numerous private groups that have an interest in harbor development activities. A listing of agencies with regulatory, resource, or developmental interests in the Buffalo Waterfront, compiled by Department of Community Development, Division of Planning, is available at the Buffalo District Corps of Engineers office.

The city of Buffalo plays a key role in development of the harbor area because the project is entirely within the city limits.

NFTA (Niagara Frontier Transportation Authority) has agreed to be the local sponsor. NFTA is a multipurpose authority ("Created by an Act of the New York State Legislature in 1967") and was "charged with the responsibility to developing air, water, and surface transportation in Erie and Niagara Counties," PORT OF BUFFALO HANDBOOK, 1978/1979.

The Buffalo City Plan expressed a need for "a program to oversee and manage waterfront resources," and the Buffalo Harbor Revitalization Study concurs saying that:

"The major institutional problems relating to harbor revitalization were: (1) the lack of an overall plan; and (2) the absence of a central directive force to unify independent decisions being made for the harbor area. Overlapping authority has produced conditions in which no single agency has taken the lead in waterfront development. As a consequence, no overall plan has been developed. There are many proposals for the waterfront, but quite often they are in conflict with the other."

The most significant development in recent months regarding the Buffalo Waterfront has been the formation of the Buffalo Waterfront Planning Board. Its membership includes all the prominent organizations in the Buffalo area with an interest in the waterfront. The goal of the Board is to develop a master plan for the future development of the waterfront. As part of this process, the Board will serve as a coordinating agency for all waterfront studies so that they will better mesh with its overall goals and objectives. As an advisory body, the Waterfront Planning Board will transmit recommendations to the city of Buffalo, NFTA, and other agencies for implementation as they deem appropriate.

(14) Transportation - Transportation is defined as the type, ease, and degree of accessibility to desired locations by people from both local and regional points of origin.

The Buffalo area has a complex transportation system including superhighways, highways, Metro Bus Service, and air transportation under the Niagara Frontier Transportation Authority which also operates the Port of Buffalo and is constructing the LRRT (Light Rail Rapid Transit). ConRail provides rail transport.

Transportation directly to the waterfront and between waterfront sites is limited to auto or walking from regular bus lines.

(15) Health and Safety - In the two-county SMSA, almost all kinds of health care can be found. As a large urbanized area, Buffalo has all of the basic services that might be required for ensuring the health and safety of its population.

In the project area itself, two specialized water related safety services are provided: the Buffalo Fire Departments fireboat, the EDWARD S. COTTER, and the U. S. Coast Guard Station in the Outer Harbor at the site of Chinaman's Light.

The health affects of air and water pollution are an important concern of this industrial area. Currently, there are several studies being carried out on toxins in the local environment. For example, the Air Quality Technical Assistance Demonstration Project has focused on the air quality in the Buffalo Harbor area over the past 2 years.

The BRIC (Buffalo River Improvement Corporation) is a water distribution system which pumps about 100 million gallons per day to upstream users of Buffalo River Water. This system was mandated by the Federal Water Pollution Control Agency to improve the water quality of the river by augmenting low flows.

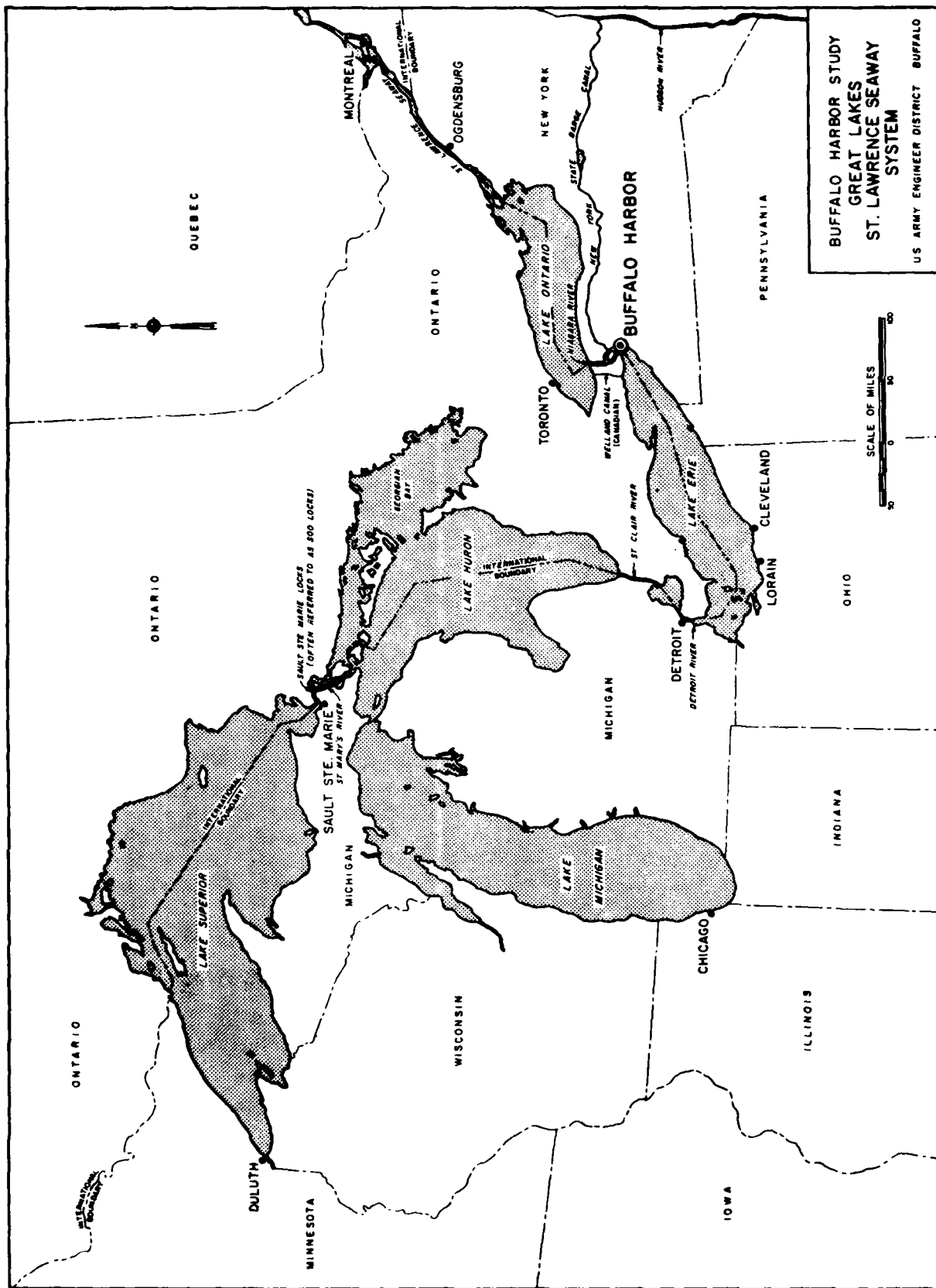
Recreational boaters do face some risk of collisions with drift in the harbor. This subject is addressed in Appendix I to the Main Report.

For the residential areas near the waterfront, District 12 describes a shortage of resident physicians and only a few small clinics in the District. Public safety services are available. Emergency rescue and fire fighting services were rated as good and police/community relations were described as improving in the 1976 report.

c. Navigation Facilities.

(1) The Great Lakes - St. Lawrence Navigation System - The Great Lakes and interconnecting channels, the St. Lawrence River, and the Gulf of the St. Lawrence provide a 2,400-mile commercial waterway from the Atlantic Ocean to the westerly end of Lake Superior. The geographic extent of the system and a schematic profile through the system are shown on Figure 8.

The section of the system between Buffalo Harbor and the Upper Great Lakes (Superior, Huron, and Michigan) is designed for a vessel up to 1,000 feet in length, with a beam of 105 feet and a draft of 25.5 feet at low water datum.



The limiting features in this section of the system are the locks in the St. Marys Falls Canal, which connect Lake Superior with Lake Huron.

The section of the system between Buffalo Harbor and the Atlantic Ocean is designed for a vessel up to 730 feet in length, with a beam of 75 feet and a draft of 25.5 feet at low water datum. The limiting features of this section of the system are the locks in the Welland Canal and the St. Lawrence Seaway.

(2) Vessel Traffic - In the past 300 years, vessel traffic on the Great Lakes has evolved from canoes to 1,000-foot bulk cargo carriers.

The first sailing vessels were introduced about 1680; the first steamer about 1820. The first bulk carrier (211 feet long) was built about 1890. Subsequent bulk carriers increased in size to about 500 feet in 1906, 600 feet in 1906, 639 feet in 1941, 678 feet in 1949, 730 feet in 1956, and finally to 856 feet and to 1,000 feet in 1972. The 1,000-foot vessel put into service in 1972 doubled the record tonnage carried by any vessel built prior to that time.

The present (1981) Great Lakes vessel fleet consists of about 349 vessels, 155 Canadian and 194 United States. About 73 percent of the fleet are bulk carriers, which account for about 92 percent of the total cargo carrying capacity of the fleet.

The fleet is arbitrarily divided into 10 classes according to vessel length. The United States bulk carriers are predominantly Class V (600-649 feet) through Class VII (700-730 feet) vessels with an average age of 42 and 23 years, respectively; the Canadian bulk carriers are predominantly Class VII (700-730 feet) vessels with an average age of 15 years. Many of the larger bulk carriers cannot operate safely in the Buffalo Harbor due to the configuration and depths of the Lakefront Harbor entrance and the river channels. The balance of the Great Lakes fleet (tankers) are Class I (400 feet) through Class IV (550-599 feet) vessels whose average age varies greatly between the U. S. and Canadian fleet. The physical dimensions of Buffalo Harbor do not restrict the operation of these size vessels.

The trend in new Great Lakes vessel construction for the last 10 years (1972-1981) is to build larger capacity vessels, especially Class X vessels (1,000 feet in length), the maximum size vessel that can transit the Upper Great Lakes. Of the 27 new vessels built during this period for the Great Lakes fleet, 13 vessels, or 48 percent, were Class X vessels. Whether this trend will continue in the future is unclear. At the present time, no Class X vessels are being built for use on the Great Lakes.

Ocean vessels up to 683 feet in length trade in the Great Lakes. The size of ocean vessels, which have deeper drafts than lake vessels, is limited by the depths and widths of the St. Lawrence Seaway and the Welland Canal. Ocean vessels deliver general cargo to facilities located along the Lakefront Harbor at Buffalo.

(3) The Present Harbor - Buffalo Harbor is part of the larger Port of Buffalo area, which includes Tonawanda Harbor, lower Black Rock Harbor, the Black Rock Ship Lock, and the Black Rock Channel.

Buffalo Harbor proper, as defined by the Corps of Engineers, runs from Bethlehem Steel Corporation's Lackawanna Plant on the south to the Black Rock Entrance Channel in the vicinity of the Erie Basin Marina on the north, and from the Outer Harbor breakwaters on the west to the upper ConRail Bridge that crosses the Buffalo River on the east.

The Outer Harbor extends along the lakefront in front of the property owned by the Niagara Frontier Transportation Authority (NFTA). It is formed by a breakwater system approximately parallel to the shore and is about 4.5 miles long and 1,600 feet wide. There are two entrance channels from Lake Erie into the Outer Harbor. These are known as the North and South Entrance Channels.

The Inner Harbor area begins at the Buffalo River Entrance Channel, and includes the Buffalo Ship Canal as well as the deepened and widened portion of the Buffalo River up to the upper ConRail Bridge. The improved portion of the river is about 5.3 miles long. Channel widths vary from 150 to 300 feet.

The harbor channels maintained by the Corps of Engineers are designed for the use of commercial vessels, although they are also used by recreational craft. Currently, the harbor primarily services ships carrying raw materials for the local steel industry and grain for the milling industry. In general, about 8 million tons go through the harbor each year.

The property owned by the Niagara Frontier Transportation Authority in the Outer Harbor area can accommodate seven ocean-going ships at a time. There are two modern terminal buildings providing 186,000 square feet of storage space and two masonry-walled buildings to shelter clays and other weather-vulnerable bulk materials. For bulk materials such as coke that do not require protection, over 150 acres are available.

Bulk cargo is the major commodity handled, but strong emphasis is being placed on developing general cargo commerce at the west berth piers. NFTA has also developed a foreign trade zone to more economically handle foreign imports and exports. A mobile gantry crane, which can handle bulk as well as general and container cargo with efficiency and speed, is a recent addition that greatly increases the port's service capacity. The recent addition of a conveyor system will aid unloading of bulk shipments.

In addition to the facilities for lake and ocean freighters, the NFTA owns and operates the small-boat harbor located just south of NFTA's general cargo terminals. It has five piers with 283 docking berths along with six launching ramps.

(4) Harbor Maintenance Operations - The various canals and other water bodies of the harbor are maintained by the Corps of Engineers, the Niagara Frontier Transportation Authority (NFTA), the city of Buffalo, and by private interests. On the south end of the harbor area, we find the Lackawanna Canal, which is maintained by Bethlehem Steel, and the Union Canal, which is maintained by Bethlehem, Hanna Furnace Corporation, and an independent cement corporation. On the north end is the Erie Basin Marina, which is maintained

by the city of Buffalo. And, along Lake Erie, there are various slips maintained by the NFTA. The Buffalo District is responsible for maintaining the depth of navigation channels in the Inner and Outer Harbor areas. Most of the dredging work is done by hopper dredges, and the dredged materials are placed in diked disposal areas.

The diked disposal area next to the NFTA small-boat harbor was built in 1967 for experimental purposes and is filled to capacity. Times Beach is another diked area adjacent to the Coast Guard Base that was constructed in 1971. It has been left only partially filled for environmental reasons. It is providing a wetland area that is conducive to a variety of wildlife.

Dredged materials are currently being deposited in a large diked disposal area adjacent to Bethlehem Steel. This area was built in 1977 at a cost of \$15 million and was designed to contain 10 years of dredged material.

The Buffalo District also maintains the breakwaters that protect these channels. Breakwater repairs are done by derrick boats powered by tugs. This is a continuous repair job because the breakwaters are constantly assaulted by the choppy waters of Lake Erie.

(5) Cargo Movement - Buffalo Harbor is an important but specialized harbor. Of the 5,500,000 net tons of cargo received in 1980 (see Table 13), 4,700,000 tons, or 85 percent consisted of iron ore, limestone, grain, and sand and gravel. Iron ore, the largest commodity received in 1980 at 2,600,000 net tons, represents 47 percent of the total tonnage. Grain, the second most significant commodity at Buffalo Harbor, accounted for about 25 percent of the total commodity movement at Buffalo Harbor in 1980.

Projected future tonnages for four commodities (iron ore, limestone, grain, and sand and gravel) are presented in Table 14. These projections were developed by the Buffalo District in mid-1982. Additional details on this process are presented in Appendix B, "Economic Evaluation."

Problems, Needs, and Opportunities.

a. Problems -

(1) Effects of St. Lawrence Seaway - The impetus for the rapid expansion and settlement of Buffalo had been its location at the eastern-most point on the four upper Great Lakes. The opening of the St. Lawrence Seaway dramatically reduced the need for an eastern terminus to the Great Lakes as it opened the lakes to ocean-going vessels.

A significant demonstration of the effect on the relative importance of the Port of Buffalo is shown by a comparison of Buffalo to other ports before and after the Seaway opening. In terms of total tonnage handled, in 1955, Buffalo ranked fifth of all Great Lakes ports and twelfth of all American ports. By 1960, Buffalo had dropped in both rankings to seventh of Great Lakes ports and 21st of American ports.

Table 13 - Selected Commodity Movements at Buffalo Harbor, NY (Short Tons)

Commodity	Year																Average : Average	
	1957	1962	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1971-1980	1976-1980
Barley and Rye	491,503	101,741	173,303	125,943	231,883	94,394	117,599	99,277	128,509	66,249	92,062	39,484	85,469	108,087	82,355			
Wheat	1,901,044	1,663,695	1,314,004	1,267,830	1,235,699	1,225,057	1,062,926	1,304,799	1,430,648	1,310,195	1,399,439	1,223,691	1,360,900	1,282,118	1,344,975			
Iron Ore	8,521,807	5,416,266	8,754,443	5,699,897	6,213,406	7,688,560	5,337,365	3,142,567	7,022,794	3,968,416	4,512,112	4,865,371	2,598,322	4,904,881	4,593,403			
Limestone	3,613,845	2,086,210	2,284,772	1,246,882	1,120,168	2,041,886	1,778,219	1,315,954	1,660,727	1,202,097	1,326,758	947,726	478,246	1,311,866	1,123,111			
Sand, Gravel, Crushed Rock	831,139	220,275	278,855	365,554	304,214	444,129	325,857	204,506	288,692	324,160	292,028	314,473	206,240	306,983	295,119			
Gypsum, Crude, Plasters	0	0	0	10,490	0	0	21,605	122,157	120,227	167,909	205,527	178,148	65,278	89,134	147,418			
Nonmetallic Minerals	27,137	51,088	141,746	171,323	281,003	121,536	159,376	151,379	97,269	250,248	182,364	87,783	80,599	158,288	139,653			
Residual Fuel Oil	351,604	219,715	117,098	185,328	199,850	253,736	233,456	141,342	183,323	171,865	301,534	257,281	116,600	204,432	206,121			
Building Cement	34,776	126,576	192,998	272,620	198,133	167,133	246,404	202,492	148,191	191,994	247,888	166,137	252,480	209,147	291,338			
Pig Iron	597,513	206,442	160,319	128,549	113,023	55,085	20,334	70,268	79,440	65,461	63,288	0	14,474	60,992	44,533			
Coke Petroleum, Asphalt	0	0	0	86,972	53,800	247,490	75,700	67,906	190,790	62,000	0	0	0	78,466	50,558			
Selected Commodity Tonnage Subtotal	16,370,368	10,092,008	13,417,541	9,561,388	7,951,179	12,339,006	9,378,841	6,822,647	11,350,610	7,780,594	8,623,000	8,080,094	5,258,608	8,714,596	8,218,584			
Total Harbor Tonnage	19,109,136	12,775,020	14,442,117	10,137,206	8,448,185	12,603,820	9,576,553	7,018,748	11,481,716	7,975,244	9,134,753	8,315,880	5,470,309	9,016,241	8,475,580			
Selected Commodities as a Percentage of Total Harbor Tonnages	86	79	93	94	94	98	98	97	99	98	94	97	96	97	97			

SOURCE: Unpublished Waterborne Commerce Statistics of the United States, Annual Port to Port Summary - 1971-1980.

Table 14 - Projected Commodity Tonnages - Buffalo Harbor (000's Short Tons)

Commodity/ Geographic Area	Project Year							
	1980	1990	1995	2000	2010	2020	2030	2040
Grain-Alternatives IIId, IIe	:	:	:	:	:	:	:	:
Buffalo Harbor	1,446.4	1,446.4	1,446.4	1,446.4	1,446.4	1,446.4	1,446.4	1,446.4
Iron Ore-Alternatives IIe, IIIf, IIIG, IIHh, IIIf, IVa, IVb	:	:	:	:	:	:	:	:
Buffalo River	:	:	:	:	:	:	:	:
Domestic	760.6	768.6	772.7	776.8	785.1	793.4	801.8	810.3
Union Canal	:	:	:	:	:	:	:	:
Domestic	81.6	107.6	123.6	141.9	187.2	246.9	325.6	429.4
Foreign	24.4	32.1	36.9	42.4	55.9	73.7	97.3	128.3
Total	106.0	139.7	160.5	184.3	243.1	320.6	422.9	557.7
Lackawanna Canal	:	:	:	:	:	:	:	:
Domestic	1,168.2	1,286.6	1,350.2	1,417.0	1,560.6	1,718.7	1,892.9	2,084.8
Foreign	563.6	633.9	672.2	712.9	801.8	901.7	1,014.1	1,140.6
Total	1,731.8	1,920.5	2,022.4	2,129.9	2,362.4	2,620.4	2,907.0	3,225.4
Limestone-Alternatives IIe, IIIf, IIIG, IIHh, IIIf, IVa, IVb	:	:	:	:	:	:	:	:
Buffalo River	:	:	:	:	:	:	:	:
Domestic	179.8	181.7	182.7	183.7	185.6	189.6	189.6	191.6
Union Canal	:	:	:	:	:	:	:	:
Domestic	25.1	33.0	38.0	43.6	57.5	75.8	100.0	131.9
Lackawanna Canal	:	:	:	:	:	:	:	:
Domestic	409.4	454.0	478.1	503.5	558.5	619.5	687.5	762.5
Sand and Gravel	:	:	:	:	:	:	:	:
Buffalo Ship Canal-Alternatives IIId, IIe	:	:	:	:	:	:	:	:
Domestic	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9
Outer Harbor-Alternatives IIe, IIIf, IIIG, IIHh, IIIf, IVa, IVb	:	:	:	:	:	:	:	:
Domestic	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9

Although area public officials were against the construction of the Seaway, there was hope that Buffalo would develop as an ocean port. A sampling of key statistics shows that such anticipations have not been realized. From 1957 to 1962, total tonnage handled at Buffalo Harbor decreased by 33 percent. Since the opening of the Seaway, total tonnage figures have fluctuated around 10 million annually, while prior to this event, the amounts had exceeded 16 million tons annually.

Buffalo was joined in opposition to the Seaway by Eastern railroads, Atlantic Coast Ports, organized labor, and public utilities. However, pro-Seaway interests argued that the Seaway would benefit national defense and provide American and Canadian steel mills with access to iron ore from Labrador. Until recently, Buffalo steel mills received some ore shipments from Labrador. Today, it appears that, due to larger Great Lakes ships, it is now more cost efficient to source ore from the Mesabi Range shipped in 800 to 1,000-foot vessels than Labrador ore shipped in maximum sized 730-foot Seaway vessels. Consequently, the amount of Canadian ore used by Buffalo industry has decreased.

The opening of the St. Lawrence Seaway allowed moderate-sized ocean vessels access to the Great Lakes, thereby eliminating Buffalo's locational advantage as a transfer center for cargo to the northeast coast and overseas. Further, ocean vessels could carry grain, which is less costly to transport than flour, to foreign countries through the Seaway without stopping at Buffalo. Prior to this event, transshipment in Buffalo had been reduced by the improvements along the Mississippi River which allowed for shipment of Great Lakes area grain to the Gulf Coast. As a result, in the 1950's and 1960's, transfer and storage elevators began closing operations. Foreign trade of processed products declined as Third World countries began to develop milling operations.

(2) Closure of Grain Storage Elevators - The area's grain industry had historically involved the milling of grain for flour and feed and the transshipment of western grain to other areas of the country and the world. Several factors contributed to the decline of the grain industry and the accompanying closure of grain elevators in Buffalo (Photo 1), among which are:

- . The opening of the St. Lawrence Seaway and Mississippi River access to the Great Lakes (as presented above);
- . New transportation incentives for competitors;
- . The demise of foreign markets for processed grain products;

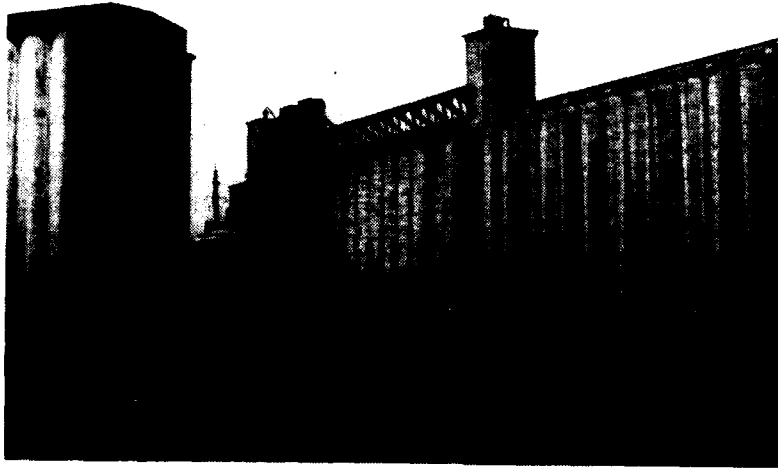


Photo 1. Grain Elevators

- . Aging plant facilities; and
- . Labor costs.

Transportation incentives and costs are discussed below under "Rail Trends, Rate Structures, and Destination Mills."

Absentee ownership of milling companies contributed to the instability of future improvements to operations in Buffalo. Having many plants throughout the country, grain companies had the option of moving operations to more competitive mills. Current milling operations in Buffalo are profitable, but their profit margins are lower than competitive mills.

Wage rates also appear to contribute to the loss of competitiveness. Buffalo's wage rates are, on the average, \$1.26 per hour higher than eastern mills and \$1.00 per hour higher than some midwestern mills. It is estimated that elevator operations require over three times the manpower per bushel of grain handled as compared to costs incurred by competitors.

With the exception of the Pillsbury Mill, which was rebuilt in 1972, the average age of mills and elevators in Buffalo is approximately 50 years. Occupational Safety and Health Administration (OSHA) standards must be met by

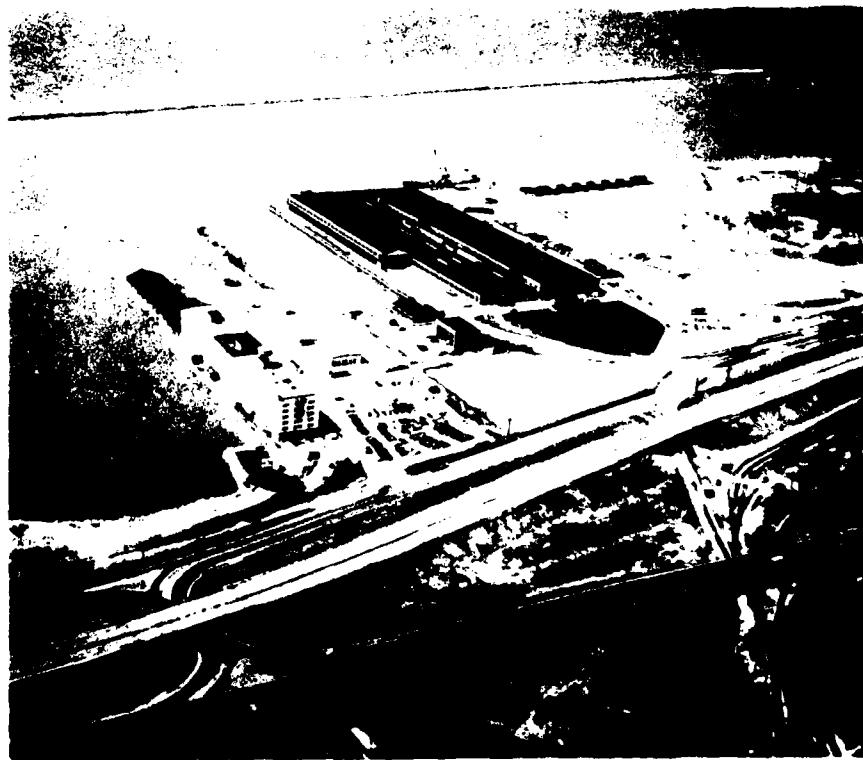
all industry facilities, but improvements are particularly costly to Buffalo mills largely as a result of the age of the facilities. Further, new milling techniques make newer operations more efficient and less costly.

Currently, there are seven storage facilities that are inactive with an unused storage capacity of more than 20 million bushels. In August of 1980, the city of Buffalo, Division of Planning assessed four possible futures for the vacant elevators:

- . Recycling for alternative uses;
- . Historic preservation;
- . Structural conversion; and
- . Demolition.

In general, recommendations called for passive preservation (actions for removing hazards) and demolition.

(3) General Cargo and Container Trends - Many Great Lakes ports, including Buffalo, are actively pursuing the development of general cargo trade. Facilities for general cargo handling are available at the NFTA docks on the Outer Harbor (Photo 2). A Foreign Trade Zone was established as part of the available facilities for general cargo. Approximately 500,000 square feet of covered storage and 200,000 square feet of open storage with rail connections are provided on NFTA property.



SOURCE: NFTA Port Handbook, 1978-1979.

Photo 2: NFTA Facilities

The majority of the newer Great Lakes vessels carrying containers and specialty steel require shoreline cranes for loading and unloading operations. The NFTA has recently acquired such cranes to facilitate the development of container handling. According to NFTA, it is estimated that Buffalo has the potential for handling as much as 835 20-foot equivalent export containers per month and 130 import containers.

Forecasts prepared by A. T. Kearney, Inc., indicate that general cargo traffic through Buffalo would benefit substantially by season extension. General cargo shippers have preferred other ports on Lake Erie, such as Cleveland, and Lake Ontario ports, such as Toronto, because of the availability of more efficient equipment. Furthermore, Buffalo's proximity to the port of New York limits prospects for the handling of general cargo. Steamship companies are pessimistic regarding Buffalo's ability to sustain the increased general cargo traffic, which is a requisite for additional port calls.

Ordinarily, steamship lines bypass smaller general cargo ports such as Buffalo and concentrate their business at ports where cargo is more plentiful in order to minimize their calls.

Shippers, searching for service continuity and reliable and efficient handling, have not found Buffalo adequate in these respects. Industries will not send cargo to Buffalo without assurances that it will be picked up at regular intervals by steamship companies. And, as was stated above, steamship companies will not schedule regular stops in Buffalo unless they have assurances there will be cargo waiting on the docks.

(4) Dry Bulk Trends - Although total tonnage has dropped to an average annual tonnage of approximately 8 million tons, dry bulk cargo continues to account for a large majority of tonnage handled. Iron ore, grain, and limestone are the principal dry bulk commodities handled at Buffalo Harbor. These commodities accounted for 80 percent of the total tonnage handled in 1978. Iron ore alone accounted for approximately 50 percent of the total. Outer Harbor bulk storage lands are illustrated in Photo 3.

Of major concern to many inner harbor users is the maintenance of the current level of operations. The grain industry, as mentioned before, is beset with numerous problems, and some mills have fallen to marginal profitability and below.

Steel industry spokesmen do not foresee any large-scale expansion of operations in the future. The age of Buffalo's steel plants is also viewed as a problem because of the marginal efficiency and the corresponding effects on profitability at these plants.



Photo 3. Outer Harbor Bulk Storage Lands

(5) Buffalo's Steel Industry - The Buffalo Steel Industry is important to the Buffalo economy. Three companies - Behtlehem, Republic, and Hanna Furnace - have historically employed a significant number of the area's workforce.

In 1860, the first blast furnaces were erected to become, in 1862, the Union Iron Works. The first open-hearth furnace began operation in 1888. Buffalo became a major steel center in 1903 with the opening of the Lackawanna Steel Company (now Bethlehem Steel).

Since that time Hanna Furnace and Republic Steel have located in Buffalo. In the 1940's, Republic Steel in Buffalo was the third largest steel plant in the country.

The following factors have contributed to what is considered by many to be an uncertain future for the steel industry in Buffalo;

- . Foreign competition
- . Age of facilities
- . New technologies
- . Current economic conditions
- . Larger iron ore carrying vessels

Foreign competition has affected all American steel plants in a similar adverse manner. Foreign producers usually have low wage rates and modern facilities. Buffalo has neither. What Buffalo does have is access to the Great Lakes and the relatively inexpensive water transportation network it provides.

Community leaders have sought harbor improvements to allow Buffalo's steel companies to take advantage of the lower transportation costs of the 1,000-foot and greater ore carriers. It is hoped that such improvements would improve these companies' marginal profitability. No immediate plans for expansion or complete termination of operations have been found. However, due to the current economic recession, Republic Steel and Hanna Furnace have stopped operations at their Buffalo facilities until such time that it is economically feasible to start up again. Bethlehem Steel, the largest of Buffalo's three steel mills, is still operating, but at a reduced level.

(6) Rail Trends, Rate Structures, and Destination Mills - Throughout its history, Buffalo Harbor has been significantly affected by the rate structures of other transportation modes involved in the delivery of supplies to the harbor and processed products out of the harbor. The milling industry, which produces a commodity (flour) for which there is little product differentiation in the market, relies heavily upon transportation cost savings to provide market competitiveness. Further, since Buffalo is located a significant distance from its supplies in the midwest and its market in the northeast, the relationship between the cost of shipping grain and the cost of shipping flour is an important consideration.

Initially, Buffalo Harbor was the benefactor of preferential treatment from the railroad companies. Railroad companies owned and operated Great Lakes fleets which provided Buffalo with a well-integrated water/rail transit system. Shipping costs were minimized as Buffalo received grain in and shipped coal out.

The railroad companies granted Buffalo free milling-in-transit privileges in 1900. The importance of this action was emphasized in the 1920's when Minneapolis mills lost their milling-in-transit privileges and four mills that retained such preferential treatment were constructed in Buffalo.

Preferential rate privileges for Buffalo stimulated the development of Buffalo Harbor. Yet, even as development occurred in the 1920's the balance began to shift against Buffalo. The Interstate Commerce Commission (ICC) required the rail companies to give up their Great Lakes fleets in 1924. Buffalo then had to rely on fleets operating out of other ports.

Prior to the early 1960's, the cost of grain about equalled the cost of shipping flour by rail. Thus, the location of milling operations was not important. In 1963, the ICC granted special rates for large shipments of grain from the midwest to the southeast. With the improvement of Mississippi River locks, shipments from the midwest to the south became more cost competitive.

A millage rate is the cost of producing and delivering one cubic weight (cwt) of flour by truck to a bakery in a given area. In 1964, the millage rate on corn changed, reducing Buffalo's grain storage and feed milling business. These operations became more profitable in areas closer to the consumer market.

In 1968, the ICC removed milling-in-transit rates, replacing them with point-to-point rail rates. The relative disparity between grain in and flour out transit costs set the stage for the utilization of destination mills. Destination mills are those which are located in consumer markets and are generally small scale operations. As the trucking industry developed bulk transit capacities, the destination mill could receive better transportation savings than the larger milling operations in centers such as Buffalo.

In 1978, the ICC granted a request by Cargill for a special rate for large shipment of flour from Kansas City to Barksdale, MD. The "Barksdale rate" addressed the problem of the relative disparity of shipping costs for grain and flour. The viability of the milling industry in Buffalo was severely affected by both the development of the destination mill and the preferential rate structure for Kansas City millers.

Table 15 shows a cost comparison as of April, 1978, prepared by the Erie County Industrial Development Agency (ECIDA), for Buffalo mills, Kansas City mills, with and without the Barksdale rate, and destination mills. This table clearly shows the cost advantages for the destination mills and the mills using the Barksdale rate.

(7) Condition of Intermodal Connections - The Buffalo Harbor area has an extensive system of rail lines and roads connecting the harbor to major intra- and interstate traffic arteries. Experts have, however, agreed that the extensive infrastructure is underutilized, in need of repair, and has not been improved to meet changing transportation requirements.

The harbor is served by five major trunk rail lines. Tracks and roadbeds are well located and are generally in good repair (Fry Consultants, Waterfront Area Transportation and Development Study, 1979, p. 28). Many harbor companies have rail sidings on their property.

However, in the last 5 years, because of delays and unavailability of cars, rail transit has been increasingly abandoned in favor of the more expensive trucking mode.

The Burrows Lot provides switching from the main classification yards (where cars are decoded or coded for destination) to the specific ultimate user. The aging facility has little room for expansion and is often congested.

The waterfront area has access to the New York State Thruway and to extensive interstate road systems. The internal road system of the harbor area is only in fair condition. Among problems cited are uneven street surfaces, raised rail tracks, and streets with potholes.

Table 15 - Cost Comparison of Producing and Delivering One Cubic Weight of Bulk Flour to the New York City Area

Category	Buffalo Mill	Kansas City Mill	Destination Mill	Kansas City Mill with East Coast Transfer Terminal (Barksdale Plan)
	\$	\$	\$	\$
Cost of Wheat (2.3 bu at \$3.00)	6.90	6.90	6.90	6.90
Credit for Millfeed Sold	(1.29)	(1.20)	(1.29)	(1.20)
\$65.00 ton - Midwest				
\$70.00 ton - East				
Transportation				
Wheat In	0.62	-	1.34	-
lake			rail	
0.06		-	-	-
unload				
Flour Out				
Rail	0.93	1.97	-	1.06
Truck	0.17	0.17	0.42	0.35
Transfer Charge	0.08	0.08	-	0.25
Total Transportation	1.86	2.22	1.76	1.66
Milling				
Fixed Costs (int.-dep.-ins. taxes)	0.10	0.10	0.10	0.10
Utilities	0.11	0.11	0.12	0.11
Labor	0.72	0.45	0.50	0.45
Manufacturing Expense - Maintenance	0.08	0.07	0.08	0.07
Manufacturing Expense - General	0.07	0.07	0.07	0.07
Total Milling	1.08	0.80	0.87	0.80
TOTAL	8.55	8.72	8.24	8.16

SOURCE: "A Business Analysis of the Buffalo Milling Industry," Erie County Industrial Development Agency, 6 September 1978.

The raising of the Ohio Street Bridge for vessel traffic on the Buffalo River causes interrupted truck service. Firms have also cited snow removal as a problem.

The harbor area road service was designed primarily for the movement of employees into and out of the various firms. Because of increased cargo movements by trucks, and the subsequent deterioration of streets designed for automobiles, road repair and new road construction appear necessary.

(8) Vessel Size Limitations - Various channel configurations in Buffalo Harbor limit the size of vessels capable of servicing Buffalo. The overall trend in Great Lakes shipping is toward the utilization of larger vessels. However, even the current sized vessels using the harbor cannot fully use available carrying capacities safely.

Constraints on the St. Lawrence Seaway involve limitations at the Welland Canal. The maximum sized vessel available for ocean commerce and trade through the Seaway have the following dimensions: 730-foot length, 76-foot beam, and 26-foot draft at low water datum (LWD).^{*} Immediate planned improvements to the Welland Canal primarily involve measures to increase the capacity for handling more, but not necessarily larger, ships. However, feasibility studies to enlarge the locks are being undertaken by the Canadian Government.

The constraints imposed on shipping on the upper Great Lakes involve limitations at the Soo lock Complex (see Figure 6). The Poe Lock is the only lock that can potentially accommodate vessels with dimensions of 1,100 feet in length and 105 feet in beam. However, the largest approved ship design constructed is 1,014 feet. As more 1,000 footers are built, there is a potential for delays at the Soo Locks.

Buffalo's Outer Harbor has the capacity for servicing the maximum sized vessels of the Great Lakes/St. Lawrence Seaway System through its south entrance channel. The northern part of the Outer Harbor is limited to a depth of 23 feet as far south as north of Seaway Pier Number One. Further, there is a small trapezoid in the Outer Harbor across from the small-boat harbor that has depth of 23 feet. The remainder of the Outer Harbor has a maintained depth of at least 27 feet and somewhat less than sufficient area for maneuvering 1,000 footers. The aforementioned trapezoid precludes two-way traffic of 1,000 footers loaded to a 25.5-foot draft.

Currently, 1,000 footers use the South Entrance Channel (Photo 4) and the Outer Harbor to maneuver into the privately maintained Lackawanna Canal. Although the existing configuration of breakwaters is adequate for ideal

^{*}Navigable channel depths (project depths) and charted depths in the Great Lakes are recorded in feet below low water datum, which is a plane on each lake and a sloping surface on each outflow river. Low water datum elevations are given in feet above the mean water level in the Gulf of St. Lawrence at Father Point, Quebec, International Great Lakes Datum (1955). Low water datum elevations represent what might be termed the average low water levels rather than the extreme low water levels.

weather conditions, shipping officials have indicated changes to the breakwaters are required to provide sufficient room for maneuvering 1,000-foot vessels, particularly, during high wave conditions.



Photo 4. The Mesabi Miner

The northern section of the Outer Harbor restricts vessels with drafts greater than 23 feet. No vessel size limitations were identified, however.

The Inner Harbor consists of the Buffalo River and the Buffalo Ship Canal. The width of the Buffalo River varies from 100 feet to 700 feet (National Oceanic and Atmospheric Administration, Buffalo Harbor Soundings and Fact, 9 July 1977). Sharp bends limit vessel lengths to 639 feet and preclude sustained two-way traffic.

The Buffalo Ship Canal limits both drafts and sizes of vessels. With a depth of 22 feet, both grain and sand and gravel shippers have indicated a need to light load cargoes.

As mentioned earlier, the trend in Great Lakes shipping is towards larger vessels. The Maximum Ship Size Study, conducted by the North Central Division, estimates that the projected level of Great Lakes bulk tonnage by 2040 would require a fleet of 44 vessels of 1,000 feet or larger, as illustrated below.

Required Number of Vessels
of 1,000-Foot or Larger

1980-1990	15
1991-2000	9
2001-2010	5
2011-2020	8
2021-2030	3
2031-2040	<u>4</u>
SUM	44

Grain company officials and grain shippers, however, do not foresee the future utilization of 1,000 footers for grain traffic. Company officials suggested that 700 to 800-foot vessels would serve as the maximum sized Buffalo-bound grain vessels of the future. Shippers indicated a more conservative estimate would be a maximum length of 700 feet and some suggested that the current fleet may persist even though the average age of grain vessels servicing Buffalo is around 50 years. They point to American Steamship Company's plans to construct a new grain vessel of a length of around 630 feet. However, 80 percent of all new lake vessels on order are at least 1,000 feet long according to Greenwood's Guide to Great Lakes Shipping, 1979.

(9) Encroachment of Channels by Structures - The navigable width of the various channels is restricted by bridges. Table 16 shows both the horizontal and vertical clearances of the bridges crossing channels in the Inner Harbor.

Table 16 - Bridges Crossing Inner Harbor Channels, Buffalo Harbor

Use	Name (Location)	Bridge Type	Clearance	
			Horizontal (feet)	Vertical (feet)
Highway and Street	Buffalo Skyway			
	Buffalo River Crossing	Fixed	215	100
	Buffalo Ship Canal Crossing	Fixed	193	100
	Michigan Avenue			
	Buffalo River Crossing	Lift	177	20 down 101 up
	Buffalo Ship Canal Crossing	- *	73.5	-

Table 16 - Bridges Crossing Inner Harbor Channels, Buffalo Harbor (cont'd)

Use	Name (Location)	Bridge Type	Clearance	
			Horizontal (feet)	Vertical (feet)
Railroad Use:	Ohio Street	Lift	251	18 down 105 up
	South Park Avenue	Lift	200	19 down 95 up
	ConRail			
	at Arico	Bascule	100	18
	at Ore Dock	Bascule	112	36
	at Federal Project Upstream	Limit Bascule	97	12
	Norfolk and Western	Bascule	97	12
	Buffalo Creek	Bascule	97	12

* Superstructure removed.

SOURCE: Buffalo: Soundings in Feet Map, 9 July 1977.

(10) Collection and Removal of Drift and Debris - The channels and tributary waterways of Buffalo Harbor, Black Rock Channel and Tonawanda Harbor, and Niagara River often contain drift and debris which are a hazard to small-boat navigation and pose a public health menace. During the preparation of a report dated February 1965, a public hearing was held by the District Engineer and the following measures were requested regarding floating drift and assorted waterfront debris:

- Inspect waterfront structures and remove or repair those which are disintegrating.
- Enforcement of existing laws related to refuse disposal, industrial discharges, and flushing of bilges in or near waterways.
- Collection, removal, and incineration of floating drift.
- Advise boat operators of their responsibility in keeping channels and waterways free of debris.
- Remove debris which has collected on breakwaters and creek banks.
- Exercise extreme care in all types of waterfront construction to prevent materials from entering waterways.

Periodic maintenance for the removal of drift is conducted at selected locations, although not to the extent that was expressed at the public meeting. A renewed interest in debris and drift removal has been sparked by Buffalo waterfront revitalization proponents and a serious review of these desires is contained in Appendix I of this report.

(11) Other Problems - There is a high concentration of unimproved and underimproved property in the harbor area. Approximately 15 percent of the area is vacant. Publicly owned property represents 40 percent of the area of which 10 percent is city-owned, excluding streets. The other large property owners in the harbor area are the railroad companies.

Many buildings are in a state of disrepair. City-owned properties such as the old city freight house are dilapidated with debris scattered throughout the properties (Photo 5).

Deteriorating buildings may present health hazards, discourage prospective commercial and industrial concerns interested in harbor area locations, and limit aesthetic potential in the vicinity.

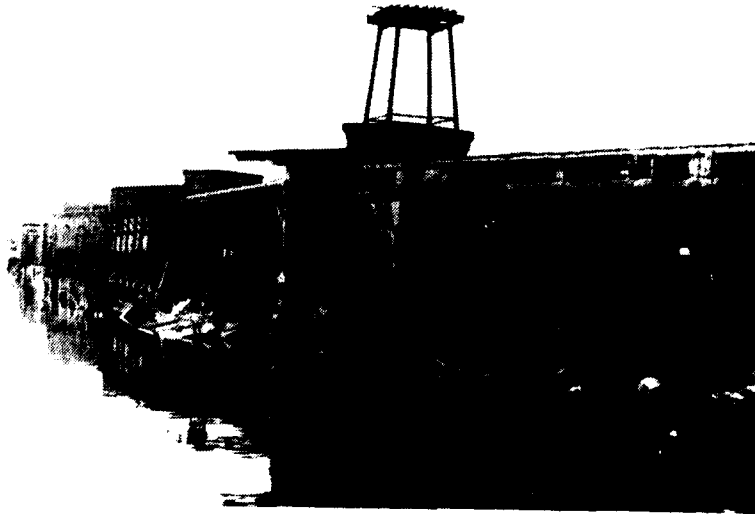


Photo 5. Dilapidated Freight House

b. Needs and Opportunities.

The needs and desires relating to navigation as expressed by various public interests are summarized in the following discussion, including;

realignment, deepening and widening, turning basins, improvements to facilitate the safe operation of 1,000-foot vessels, season extension, transshipment, ConRail's future, and potential coal center development.

(1) Realignment - Studies have called for the realignment of the Buffalo River since the 1920's. Certain realignment measures have been taken to reduce the sharp bends of the meandering river. Many plans have been considered to provide such a measure, most of which are variations on a theme to provide access to the Republic Steel Company upstream.

The desire to straighten the river is based on the new trend in ore carriers towards the 1,000-footers. It is estimated that bends in the river constrain vessel sizes to a maximum of 639 feet. Therefore, Republic Steel is not capable of using the type of vessel utilized by competitors.

Straightening measures would open up new areas, some of which are not vacant, to waterborne commerce and industrialization. Such measures would address the community's desire to revitalize the harbor area and provide jobs and income to the community.

Since it was determined in Stage 1 that this concept is not economically justified, this idea will not be considered further in this study.

(2) Deepening/Widening - The project depths of Buffalo Harbor both hinder and contribute to the ease of navigation. For the most part, the Outer Harbor south of NFTA's Seaway Pier Number One, has a Federally maintained project depth of 27 feet. This depth is not adequate to sustain a 1,000-foot vessel with a width of 105 feet carrying approximately 60,000 tons of cargo. It should be deepened 1 additional foot.

The Inner Harbor has a Federally maintained depth of 22 feet. This is reduced by 2.5 feet to allow for vessel squat and bottom clearance. At full load, vessels with lengths of 639 feet and widths of 72 feet do not have sufficient depth for navigation in the Inner Harbor.

Industry spokespeople indicated that the Inner Harbor project depths have forced shippers to transship from the Outer Harbor to their sites in the Inner Harbor or to utilize vessels that are not fully loaded.

The north entrance channel has a project depth of 25 feet leading into a portion of the Outer Harbor which has a project depth of 23 feet. Any significant improvements to the Inner Harbor would have to incorporate deepening of the north entrance channel to facilitate entrance into the river and ship canal.

Grain shippers using the ship canal have indicated that during certain low water stages, it is necessary to light load vessels of lengths up to 639 feet by as much as 1 foot. Although this is not considered a serious problem by grain shippers, considerations of possible future fleet compositions should include deepening measures.

The problems associated with the south entrance channel are discussed under, "Improvements to Facilitate Safe Operations of 1,000-Foot Vessels" in this section.

Widening measures are necessary in the Inner Harbor for safe navigation under existing conditions. For vessels of 60 feet in beam, standard marine engineering requires at least 310-foot channels for two-way traffic. Many points along the river have widths of only 200 feet.

(3) Turning Basins/Areas - Desires for turning basins were not directly expressed in the survey of industries. However, for the larger vessels on the river, it is necessary to use tug boats to maneuver the ships. The use of tug boats is an additional cost which increases overall transportation costs.

(4) Improvements to Facilitate Safe Operation of 1,000-Foot Vessels - This section focuses on improvements to the Outer Harbor. Initial contact with shippers whose 1,000-foot vessels already service the Port of Buffalo through the South Entrance revealed some problems were encountered in maneuvering 1,000 footers into Buffalo during good weather conditions.

It was found that because of wind, wave action, and currents on Lake Erie, additional protection would be needed and could be provided by extending the Stony Point Breakwater to assure greater vessel control through the harbor entrance. Further, to allow for more flexible maneuvering, the south entrance breakwater parallel to the shore of the Outer Harbor should be shortened from its southern-most point and a new 1,000-foot long lakeward extension incorporated. These measures would help prevent potentially severe structural damages to ships and breakwaters in storm conditions and provide a more efficient configuration under normal weather conditions.

(5) Season Extension - The Detroit District, U. S. Army Corps of Engineers, is studying the possible effects of the extension of the navigation season on the Great Lakes/St. Lawrence System. Conclusions drawn from the Final Survey Study, August 1979, indicate that Buffalo would benefit from season extension in increased tonnages in grain, iron ore, and general cargo. Currently, the shipping season in Buffalo lasts 275 days. Commodity projections are being reviewed and updated at this time.

Grain officials estimate that as much as \$2 million per year could be saved by the grain industry alone if season extension were enacted. They estimate that the transportation savings attributable to the water mode over the rail mode, which must be employed during the winter months, is \$55,000 a day.

(6) Transshipment - Transshipment options for bulk commodities were considered via conveyor systems, pipelines, and barges. The NFTA indicated a desire to have these options (in particular barge and conveyor systems) investigated. In lieu of extremely costly channel realignment, deepening, and widening, NFTA's position is that marked transportation savings, gained through the use of available larger vessels, may offset the capital investment required from private industries.

Republic Steel officials stated that various transshipment options had been investigated in the past, but none were considered feasible at that time. This is due, in part, to the lack of other companies in the vicinity of the eastern reach of the Buffalo River that could share in costs. However, Republic Steel is interested in the reevaluation of such transshipment options.

Iron ore pellets can be shipped through a slurry pipeline or a closed conveyor system. Such facilities would require rights-of-way from railroads that are in competition with such transshipment options.

Interest in barge transshipment was expressed in earlier studies and in conversations with participants at the Public Meeting and the Orientation Workshop. Current channel configurations could enable safe passage for two-barge tows according to Great Lakes Towing officials. Initial concern for the feasibility of this option involved the considerable loading and unloading costs that would be incurred.

Grain industry spokesmen were skeptical about the feasibility of conveyor transshipment, because existing shipping arrangements are considered adequate and grain does not currently move in self-unloading vessels. Other factors include an uncertain future, with stiff competition, from other mills within and outside of their own companies, and uncertainty about significant increases in grain vessel sizes.

In a study for NFTA entitled "Feasibility of Bulk Handling Transshipment Facility at the Port of Buffalo," PRC Harris determined that coal transshipment facilities are not economically feasible as of the October 1979 writing. Furthermore, the National Waterways Study has concluded that new coal demand will be slow to develop in the Great Lakes because of: (1) the shortened navigation season, and (2) the inability of coal consumers to receive the commodity by rail and vessel.

(7) ConRail Future - As was mentioned in the section on the "Condition of Intermodal Connections," rail service is such that many shippers/receivers have opted for the more expensive, but available, and reliable trucking mode. The reasons cited, by many, for this shift are based primarily on ConRail's decision not to improve the important switching facility at the Borrows Lot and overall rail car shortages.

The lack of available rail cars is a key contributing factor to the modal change. The unavailability of cars could be the result of the railroad's uncertainty for future demand and the nature of the grain business that requires ready access to rail cars often for immediate deliveries. Such immediate needs, however, are most frequently and naturally handled by the trucking industry. Also, perceptions of uncertain demand are shared with industry officials.

(8) Potential Coal Center Development - Recently, much interest has been expressed in the future of Buffalo as a coal port. In its early history, Buffalo Harbor was a transshipment port with ships carrying grains in and

transshipping coal from east to west. This well integrated shipping system made Buffalo one of the most active ports in the country.

Today, western coal could be handled at Buffalo or at many other ports in the country, but Buffalo is considered by many to be the ideal site for the transshipment of coal from the west to eastern markets. State officials are actively campaigning for such facilities, even though a study by PRC Harris concluded that such a facility is not economically feasible at this time.

There are other opportunities for movements of coal into the Harbor Region that rely heavily upon transshipment to coal burning power stations and to coal gasification or coal liquefaction plants now being considered for development. Niagara Mohawk's Huntley Power Station on the Niagara River uses coal, but has its own unloading facilities, and rail facilities are being constructed that may eliminate water shipments. Plans for a new coal burning power station, Niagara Mohawk's Lake Erie Generating Station (LEGS) also include a coal unloading facility, but plans may change. At this time, company officials believe that transshipment through Buffalo is not feasible without participation of other coal transshipment interests.

NFTA is interested in developing the area between seaway piers and Terminal "A" for shipments of coal to foreign markets. A steel plant in Quebec may use as much as 300,000 tons of coal within 5 years and 500,000 tons within 10 years. Shipments to northern Europe are being pursued. Negotiations are considered preliminary at this point.

Buffalo has received much support in its efforts to develop coal gasification and/or coal liquification plants in Buffalo. Officials of the Power Authority of the State of New York (PASNY) have commented that "a coal gasification facility appears to offer the greatest opportunity for immediate economic stimulation and job creation for the Western New York area." PASNY officials have recently voted to study the feasibility of building a major energy center in Buffalo. Different studies relating to the development of an energy center in Buffalo include the feasibilities of a coal gasification facility, a transshipment facility, and a coal-fired generating station.

Development of technologies for coal gasification is progressing, and demonstration facilities are being built in West Virginia and in Mercer County, ND. The West Virginia plant is estimated to cost approximately \$1.4 billion, and produce 125 million cubic feet of gas every day, which is comparable to 20,000 barrels of fuel oil. The North Dakota plant will provide valuable economic, environmental, and technical data for future projects of its kind, including projects that could best use Buffalo Harbor as a transshipment center for western coal.

Environmental effects of coal gasification/liquifaction processes were investigated. Coal gasification processes involve the reaction of coal with a steam to form carbon monoxide and hydrogen and to eliminate ash and particulate matter. The conversion of coal to liquid fuels requires complex chemical modifications. The extent of environmental impacts from coal-based synthetic fuel production is not clear because of the lack of data. It is estimated, however, that 20 percent of the coal used by the conversion plants

will be burned to supply heat and power for the operation of the plant itself and would, therefore, produce various gaseous and particulate substances, particularly sulfur dioxide and nitrogen oxide emissions. Up to 80 classes of compounds of potentially hazardous substances may accompany the conversion process. Air emissions and other areas of environmental concern, such as toxic solid wastes, water quality, and water supply would have to be considered in determining the type and level of protection required to control emissions through available pollution control techniques (Wilson, 1980)

PLANNING CONSTRAINTS

Federal policy on multiobjective planning, derived from both legislative and executive authorities, establishes and defines the national objectives for water resources planning, specifies the range of impacts that must be assessed, and sets forth the conditions and criteria that must be applied when evaluating plans. Plans must be formulated with regard to benefits and costs, both tangible and intangible effects on environmental features and social well-being of the region, and public acceptability and institutional capacity for implementation.

The formulation of a plan, including the screening of alternatives, must of necessity be within the context of an appropriate framework and set of criteria. The planning framework is established in the Water Resource Council's "Principles and Standards for Planning Water and Related Land Resources," which requires the systematic preparation and evaluation of alternative solutions to problems, under the objectives of National Economic Development (NED) and Environmental Quality (EQ). The process also requires that the impacts of a proposed action be measured and the results displayed or accounted for in terms of contributions to four accounts: NED, EQ, Regional Economic Development (RED), and Other Social Effects (OSE). The formulation process must be conducted without bias as to structural and nonstructural measures. Further, feasibility studies must be conducted with adherence to the National Environmental Policy Act of 1969 (NEPA) planning requirements and related policies, as well as guidelines established by legislative mandates issued in the River and Harbor and Flood Control Act of 1970; Federal Water Pollution Control Act amendments of 1972; Water Resources Development Act of 1974; and Executive Orders 11988 and 11990 relative to floodplains and wetlands, respectively.

Other plans proposed by Governmental or nongovernmental interests must be identified and included in the planning process. Therefore, interaction with other interests must be maintained throughout the planning process to avoid duplication of effort, minimize conflicts, obtain consistency, and assure completeness.

In this respect, identified constraints to plan formulation specific to Buffalo Harbor include:

- a. Plan must not exceed economic feasibility from a local and/or Federal cost-sharing perspective.

b. Any newly proposed channel alignment or dimension must not severely displace any necessary or significant existing or accepted proposed resource developments. In the Buffalo area these would include developments such as: the numerous rail lines that pass through the harbor area, the Skyway, significant active industrial complexes in the area, natural resource areas such as Tiffit Farms, NFTA developments, city of Buffalo proposed waterfront developments, etc.

c. Because few significant environmentally productive areas exist in the Buffalo Harbor area, these areas, identified in the existing conditions section of the Main Report and the U.S. Fish and Wildlife planning aid letters, should be protected. These areas will be identified in greater detail in Stage III of the planning study.

d. The preliminary cultural resources assessment for Buffalo Harbor, NY, indicated that the project area is rich in prehistoric, historic, and architectural resources. These resources will be examined in further detail in Stage III of the planning study and must be given proper consideration in plan formulation.

NATIONAL OBJECTIVES

Current Federal policy, as developed by the President's Water Resources Council, requires that the alternative water and related resource plans be formulated in accordance with the national objectives of National Economic Development (NED) and Environmental Quality (EQ). Therefore, in accordance with the guidance established in Engineering Regulation 1105-2-30, "General Planning Principles," dated 5 February 1982, this study was consistent with the planning requirements of the Water Resources Council "Principles and Standards" (P&S) and related policies. In accomplishing the study, equal consideration was given to the P&S objectives of NED and EQ described below:

a. National Economic Development (NED) - National Economic Development is achieved by increasing the value of the nation's output of goods and services and improving economic efficiency.

b. Environmental Quality (EQ) - Environmental Quality is achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

SPECIFIC PLANNING OBJECTIVES

Specific planning objectives are the national, State, and local water and related land resources management needs (opportunities and problems) specific to a study area that can be addressed to enhance National Economic Development and Environmental Quality. Based on a review of the directives established by the authorizing legislation for the Buffalo Harbor Study, previous reports for the area, statements by individuals in the private sector, input from officials at many levels of Government and an analysis of the problems and needs of the study area, as discussed previously, the specific

planning objectives for the Buffalo Harbor study that have been identified are as follows:

Commercial Navigation Objectives

- Contribute to navigation in Buffalo Harbor (reflected in improved efficiency of transportation during the 1990-2040 period of analysis.
- Contribute to navigational safety and efficiency by allowing for a reduction of safety hazards during the 1990-2040 period of analysis.
- Contribute to commercial and industrial enhancement of the harbor area by considering the changing commercial and industrial activities and attendant facility needs during the 1990-2040 period of analysis.

Human Environmental Objectives

- Contribute to the community's redevelopment efforts by coordinating with the actions of others and acting on existing authorities during the 1990-2040 period of analysis.
- Contribute to recreational resources, particularly by providing additional opportunities adjacent to the waterfront during the 1990-2040 period of analysis.

Environmental Objectives

- Contribute to water quality for conservation of aquatic habitat and fauna and recreation during the 1990-2040 study period.
- Contribute to wetland protection and enhancement for ecological diversity during the 1990-2040 study period.
- Contribute to conservation of existing and future terrestrial habitat during the 1990-2040 study period.

CONDITIONS IF NO FEDERAL ACTION IS TAKEN.

Evaluating the possibility of not taking any action is mandated by Federal Regulations. This process indicates what conditions in the project area would be like, in the future, without a Federal project.

With the No-Action Alternative there would be no modifications made in the Inner or Outer portion of the Buffalo Harbor unless action was taken by local authorities or private enterprise. Therefore, commercial vessels would continue to operate under current constraints. That is, only vessels of 639

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BUFFALO HARBOR STUDY PRELIMINARY FEASIBILITY REPORT
VOLUME 1 MAIN REPORT(U) CORPS OF ENGINEERS BUFFALO NY
BUFFALO DISTRICT APR 83

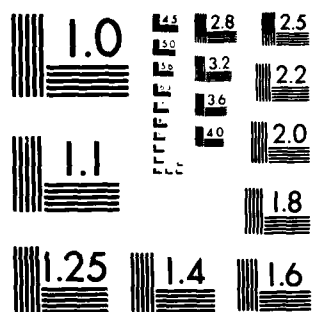
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feet in length can navigate the Buffalo River and Ship Canal. Vessels in the Inner Harbor would continue to move light-loaded, thus reduced in efficiency. One thousand-foot vessels would continue to enter the South Entrance Channel at risk. If lake levels drop to their lows, as they have in the past, these constraints on vessels would worsen.

Without further improvements for commercial navigation in the harbor, more industries (i.e., grain) could fall far enough behind in economic efficiencies that local mills would close. Lack of improvements could serve as a disincentive for local steel producers to reopen or increase activities or otherwise utilize the facilities here. Further, secondary or tertiary effects ("ripple effects") could occur involving depressed employment, increased unemployment, and subsequent lowering of incomes, reduced tax revenues, and further deterioration of the area aesthetic.

A reduced city population might coincide with negative growth goals for the community. However, lack of employment opportunities could drive residents out of the SMSA entirely, which would not be consistent with plans for local and regional growth. Pressure on the existing housing stock might be eased if indeed, the city lost population. Noise could be decreased in this scenario. Air and water pollution could decline as well.

Land use may become increasingly inefficient. With the possibility of reduced local revenue, water-related recreational opportunities may not be able to be expanded to meet current demands.

With no Federal Action, the potential for recreational access enhancement through Federal support would be lost. This could particularly impact on low income populations (i.e., the lower West Side) who might not have automobile access to waterfront sites and might lack the resources to go further afield for water-based recreational activities.

With No-Action, there would be no disturbance of the existing natural environment, however, any opportunities for development of aquatic or terrestrial habitat will be lost.

No Federal Action would result in no fiscal demands for cost-sharing on local Government, but also places responsibility for any navigation improvements entirely on local authorities. Because some of the plans have shown benefits greater than costs, no Federal Action could result in a net loss for the local economy.

If No Federal Action becomes the Selected Plan and would be the plan of choice for the local sponsor, Federal activities would then be consistent with community and regional growth goals and could, therefore, contribute to general community cohesion. However, the opposite is also true, i.e., a choice of No Federal Action where the cooperating agency, NFTA, the Waterfront Planning Board, and the city of Buffalo; desire improvements could be contrary to local and regional plans and be perceived as discouraging for the area and business and industry as well.

These scenarios are intended to serve as an example or draw the readers attention to a possible chain of events that could be set off by a particular Federal action or lack of it, in this case. It is not meant to suggest that these events will occur if the No Action Plan is implemented or that they won't occur if a Federal Action Project is carried through.

SECTION III

FORMULATION OF PRELIMINARY ALTERNATIVE PLANS

FORMULATION OF PRELIMINARY PLANS

The objective of this study is to identify the best general plan(s) for satisfying the commercial navigation needs at Buffalo Harbor based on physical constraints, the desires and preferences of local interests, and sound engineering, economic, and environmental principles. In this process, an iterative procedure that provides for increased levels of refinement in design and critique and evaluation by the principal study participants (i.e., Corps of Engineers; New York State Department of Environmental Conservation; U. S. Fish and Wildlife Service; Waterfront Planning Board; Buffalo Port Authority; and harbor users) is used to narrow the range of alternatives to carry forward. The procedure also allows for review and comments by the general public at informal meetings, workshops, and public meetings.

GENERAL FORMULATION AND EVALUATION CRITERIA

Federal policy on multiobjective planning, derived from both legislative and executive authorities, establishes and defines the national objectives for water resource planning, specifies the range of impacts that must be assessed, and sets forth the conditions and criteria which must be applied when evaluating plans. Plans must be formulated to meet the needs of the area with due regard to benefits and costs, both tangible and intangible and effects on the ecology and social well-being of the community.

The formulation of a plan, including the screening of alternatives, must of necessity be within the context of an appropriate framework and set of criteria. The planning framework is established in the Water Resource Council's "Principles and Standards for Planning Water and Related Land Resources," which requires the systematic preparation and evaluation of alternative solutions to problems, under the objectives of National Economic Development (NED) and Environmental Quality (EQ). The process also requires that the impacts of a proposed action be measured and the results displayed or accounted for in terms of contributions to four accounts: NED, EQ, Regional Economic Development (RED), and Other Social Effects (OSE). The formulation process must be conducted without bias as to structural and nonstructural measures.

The evaluation results will be displayed where significant to plan selection and will include the following "specified evaluation criteria:"

- Technical criteria require adequate channel dimensions to accommodate prospective vessel traffic and future port

development. These criteria require a plan to be consistent with local, regional, and State plans for land use and port development. To allow for future development of the harbor areas, sufficient transportation and utility access should be available.

- . The economic criteria require that tangible benefits attributable to the project exceed project costs. The scope of the proposed plan should be such that the annual benefits exceed the annual costs to the maximum extent possible. Cost estimates are to be based on current prices, annualized using a 50-year period of analysis and with an interest rate of 7-5/8 percent (presently 7-7/8 percent, but analysis is based on 7-5/8 percent due to timing of work effort). These criteria are used to develop a plan that achieves the NED objective and provides a base condition for consideration of other economically unquantifiable factors that may impact on project proposals.
- . Environmental criteria include specific measures to meet the EQ objective. These criteria include measures to protect, preserve, or restore and enhance existing environmental values and to minimize unavoidable damages to the environment.
- . Social and other criteria include identification, protection, and preservation or restoration of existing historical, archeological, and cultural resources that might be affected by a project. A plan proposed for implementation should have an overall favorable impact on the social well-being of affected interests and should have overall public acceptance.

Within the structure of the overall planning framework, other more specific criteria relative to general policies, technical engineering, economic principles, social and environmental values, and local conditions must be established. These criteria, noted as "Technical," "Economic," and "Socioeconomic and Environmental" are listed as follows:

a. Technical Criteria.

- (1) Design wave and lake level for design of breakwater crest elevations should be based on the commercial navigation season which is assumed to extend from April to December on Lake Erie.
- (2) Design frequency using the 20-year recurrence significant deep water wave height in combination with the 10-year lake level should be used for stability design of breakwater structures.
- (3) Overtopping of protective works for the design condition would be permitted to the extent that the residual interior wave shall be limited to a

height consistent with safe and efficient operation of the commercial navigation facility.

(4) Plans for modifying the South Entrance shall be formulated such that wave activity in the Lakefront Harbor does not increase.

(5) Design criteria for the South Entrance Channel will be based on the results of an 8 April 1981 vessel master's workshop meeting in Cleveland, OH, under the authority of the Cleveland Harbor Study.

(6) Breakwaters will be designed to prevent increased starvation to downdrift areas.

(7) Channel width design will be based on criteria established in Draft EM 1110-2-XXXX and other available technical literature.

(8) Channel depth design will be based on the best available technical information, input from experienced vessel masters, a static draft of 25.5 feet, and low water conditions which are exceeded 95 percent of the time (i.e., LWD - 568.6).

(9) Stability of existing bulkheads after channel deepening will be based on analysis of data obtained from available Department of the Army Permits which cover a percentage of all bulkheads. Based on the results of this stability analysis, the results will be expanded to cover the remaining bulkheads for which permit information is not available.

(10) Design of new bulkheads will be based on criteria established in Draft EM 1110-2-2906, dated 16 November 1970.

b. Economic Criteria.

(1) Tangible benefits should exceed project economic costs.

(2) Each separable unit of improvement or purpose should provide benefits at least equal to its cost unless justifiable on a noneconomic basis.

(3) Each plan, as ultimately formulated, should provide the maximum net benefits possible within the formulation framework.

(4) The costs for alternative plans of development should be based on preliminary layouts, estimates of quantities, and June 1982 unit prices.

(5) The benefits and costs should be in comparable economic terms to the fullest extent possible.

(6) A 50-year economic life and 7-5/8 percent interest rate are used for the economic evaluation.

(7) The project evaluation period is a 50-year interval beyond the estimated implementation date of 1990.

(8) The base case for comparison of alternative plans is the "do nothing" (no action) plan.

(9) A 275-day navigation season will be assumed for Stage 2. A sensitivity analysis on this assumption will be conducted in Stage 3, if warranted.

(10) For Stage 2, assume that the present Great Lakes Navigation System will not be substantially altered and that the locks at Sault Ste. Marie will not constrain commodity growth at Buffalo Harbor. A sensitivity analysis on this assumption will be conducted in Stage 3, if warranted.

(11) Maximum vessel operating draft is based on low water conditions (i.e., LWD).

c. Socioeconomic and Environmental Criteria. The criteria for socioeconomic and environmental considerations in water resources planning are prescribed by the National Environmental Policy Act of 1969 (PL 91-190) and Section 122 of the River and Harbor Act of 1970, (PL 91-611). These criteria prescribe that all significant adverse and beneficial economic, social, and environmental effects of planned developments be considered and evaluated during plan formulation.

d. Other Considerations.

(1) Cost Sharing - Traditional cost allocation between Federal and non-Federal interests for commercial navigation is established by law. However, the President recently submitted proposed legislation to provide for full recovery of certain operation and maintenance costs for deep draft ports and their connecting channels on or after 1 October 1982 and for full recovery of construction costs for deep draft ports and their connecting channels which receive initial construction funding on or after 1 October 1981. Therefore, Federal and non-Federal costs for commercial navigation modification plans are presented for both traditional and proposed cost allocation methods. Traditional and proposed cost allocation methods are as follows.

(a) Traditional Cost Allocation - Federal costs in commercial navigation projects under traditional cost allocation methods include 100 percent of the design, construction, and operation and maintenance costs of breakwaters, navigation channels, and aids to navigation. Federal responsibilities also include cost sharing on the design and construction of bridge alterations when required for navigation improvements under the provisions of Section 6 of Public Law 647, 79th Congress, as amended. Non-Federal responsibilities for commercial navigation projects include 100 percent of the costs for lands, easements, and rights-of-way; building demolition and replacement; removal, replacement and/or relocation of railroad track and utilities; and required bank stabilization and bulkhead construction. Non-Federal interests are also responsible for deepening berthing areas and slips adjacent to general navigation channels and for the design and construction of all docks and related upland facilities.

(b) Proposed Cost Allocation - Non-Federal interests are responsible for 100 percent of the design, construction, and operation and maintenance costs

of commercial navigation projects for which initial construction funding is received on or after 1 October 1981.

ALTERNATIVES CONSIDERED

a. Stage 1. During Stage 1 of this feasibility study, consideration was given to a full range of alternatives for moving bulk cargo to and from industries served by Buffalo Harbor. In general, these alternatives range from modifications to the existing harbor for more economical direct waterborne movements, to plans for various land modes of transportation for all or part of the bulk cargo movements.

A complete nonstructural alternative was not developed as such a plan would not fully satisfy the commercial navigation objectives. During the course of this feasibility study, nonstructural plans may develop and must be given full consideration.

In addition to an alternative to maintain the current harbor with no further improvements, 15 structural harbor modifications and transshipment alternatives and combinations thereof were investigated during the reconnaissance study effort. Generally, these alternatives fell into the following categories.

(1) River Improvements for 1,000-Foot Vessels - Due to the physical characteristics of a 1,000-foot vessel, most of the specific alternatives under this category of improvements call for the existing river channel to be realigned.

Alternatives Ia through If were developed to enable 1,000-foot vessels to enter the Inner Harbor. These alternatives were as follows:

- Ia. (Figure 9) The southern section of the Outer Harbor would be deepened, and the Buffalo River would be rerouted through the NFTA Small-Boat Harbor to the ConRail Corporation Bridge. A turning basin would be constructed using a segment of the existing river channel.

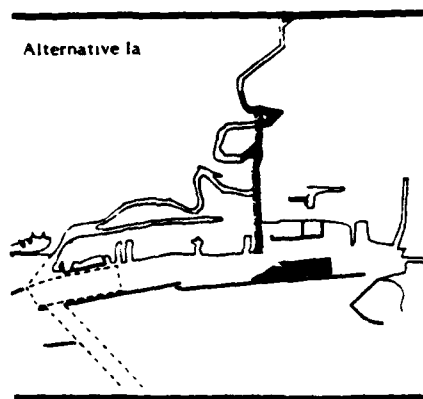


Figure 9

- Ib. (Figure 10) The southern section of the Outer Harbor would be deepened. The Buffalo River would be rerouted through the Allen Boat Company slip to the existing channels, and from there to the ConRail Bridge. A turning basin would be constructed using a segment of the existing river channel.

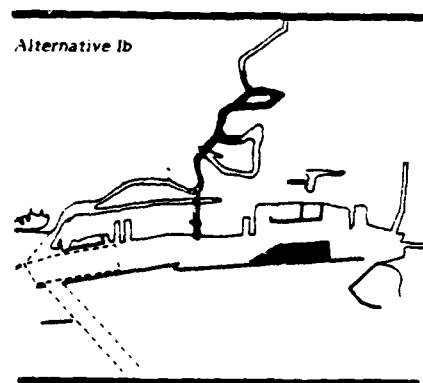


Figure 10

- Ic. (Figure 11) The North Entrance Channel and the northern section of the Outer Harbor would be deepened. The Buffalo River would be improved from the entrance channel to the ConRail Bridge. A turning basin using a segment of the existing river channel is also included in this alternative.

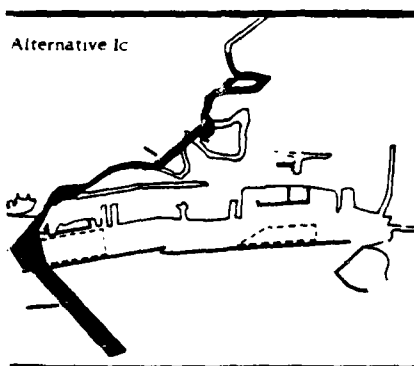


Figure 11

- Id. (Figure 12) The North Entrance Channel and the northern section of the Outer Harbor would be deepened. The Buffalo River and Buffalo Ship Canal would be improved, and a new channel would be constructed from the canal to the river. A turning basin would also be included.

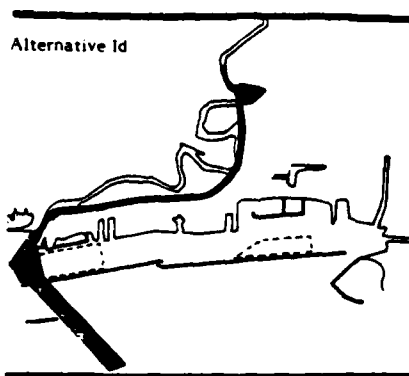


Figure 12

- Ie. (Figure 13) The North Entrance Channel and the northern section of the Outer Harbor would be deepened. The Buffalo River would be improved from the Entrance Channel to the Ohio Street Bridge, and the Buffalo Ship Canal would also be improved.

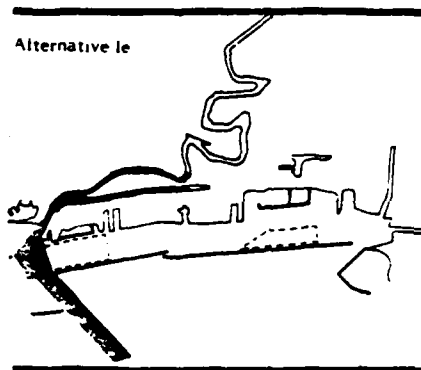


Figure 13

- If. (Figure 14) The North Entrance Channel and the northern section of the Outer Harbor would be deepened. The Buffalo River Entrance Channel, the Buffalo River, and the Buffalo Ship Canal would all be improved, and a new channel would be constructed between the river and ship canal.

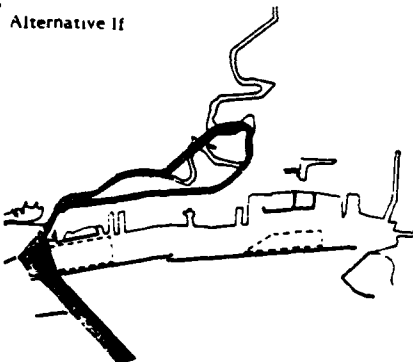


Figure 14

Economic analysis of these six alternatives are displayed in Table 17 and revealed cost estimates ranging from \$83 million for Alternative Ie to \$293 million for Alternative Ib. Economic analyses of the alternatives did not show benefit to cost ratios greater than one. The largest ratio was 0.86 for Alternative Ie.

Table 17 - Estimated Construction Costs (1) and Benefit/Cost Ratios

Alternative Scheme	:	First Cost (1)	:	Benefit/Cost Ratio
	:	\$:	
Ia	:	195,160	:	0.30
Ib	:	293,035	:	0.49
Ic	:	207,490	:	0.44
Id	:	201,700	:	0.61
Ie	:	83,390	:	0.86
If	:	241,235	:	0.39
IIa	:	39,570	:	3.21
IIb	:	37,780	:	2.22
IIC	:	24,690	:	1.75
IIIa	:	33,610	:	3.43
IIIb	:	27,880	:	4.19
IIIc	:	15,068	:	3.51
IIId	:	23,525	:	2.16
IIIe	:	4,050	:	0.66
IV	:	15,430	:	-

(1) Thousands of 1980 dollars.

Environmental impact analysis of the alternatives indicated that channel realignments would produce a direct loss in terrestrial habitat and degradation of the aquatic habitat and water quality. Deepening and widening efforts would degrade water quality and aquatic biology, and problems would be encountered in the deposition of dredged materials.

(2) River Improvement for 700-Foot Vessels - Due to the physical characteristics of the smaller 700-foot vessels, all of the specific alternatives under this category of improvements require only that the existing channel be deepened.

Deepening measures for the Inner Harbor are addressed in Alternatives IIa, IIb, and IIC. These measures consider deepening and do not include channel realignment efforts.

- IIa. (Figure 15) The North Entrance Channel, the northern section of the Outer Harbor, the Buffalo River Entrance Channel, the Buffalo River (to Republic Steel), and the Buffalo Ship Canal would all be deepened. A turning basin would be constructed at the upper end of the channel improvements.

Alternative IIa

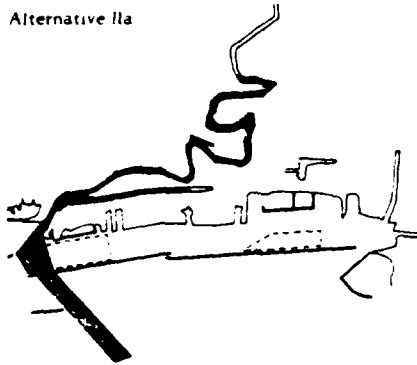


Figure 15

- IIb. (Figure 16) The North Entrance Channel, the northern section of the Outer Harbor, the Buffalo River Entrance Channel, and the Buffalo River (to the ConRail Bridge) would all be deepened.

Alternative IIb



Figure 16

- IIc. (Figure 17) The Northern Entrance Channel, the northern section of the Outer Harbor, the Buffalo Entrance Channel, and the Buffalo Ship Canal would all be deepened.

Alternative IIc

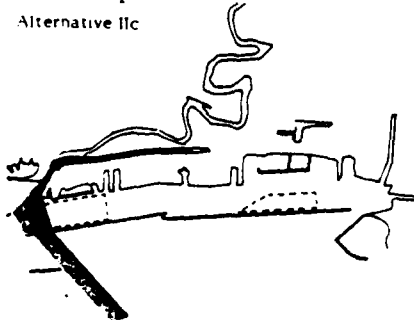


Figure 17

Economic analysis of the three deepening alternatives (Table 17) revealed costs ranging from \$25 million for Alternative IIc to \$40 million for Alternative Ila. Alternative Ila, which deepens the Buffalo Ship Canal and Buffalo River to Republic Steel, has a B/C ratio of 3.21. Other deepening alternatives also had B/C ratios above unity. The deepening of the Ship Canal may not result in significant benefits because the canal might still be unable to accommodate larger vessels. The problem needs to be subjected to further study. However, savings are accrued from fully loading the present vessels using the ship canal.

Environmental impact analysis of the alternatives indicated that deepening would have adverse effects on water quality and aquatic biology. Further, concern was expressed as to associated problems with bank stabilization. Problems would be encountered with the deposition of dredged materials.

(3) Transshipment from the Outer Harbor to Upriver Industrial Facilities - Alternatives IIIa through IIIe involve various transshipment modes such as conveyors, pipelines, and barges that would take bulk cargoes offloaded from large vessels in the Outer Harbor and transport them to various points in the Inner Harbor. These alternatives, which would avoid the very large costs connected with the channel realignment alternatives, are as follows:

- IIIa. (Figure 18) The southern section of the Outer Harbor would be deepened, and a grain conveyor system would be built from the Outer Harbor that would serve General Mills, Pillsbury, Peavey, International Multifoods, and Standard Milling.

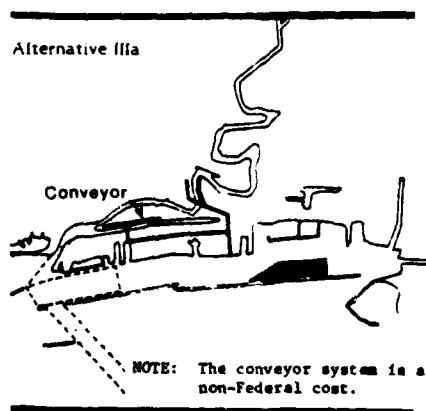


Figure 18

- IIIb. (Figure 19) The Seaway Pier Number 2 slip would be deepened, and a conveyor system would be built from the Number 2 slip to General Mills, Pillsbury, Peavey, International Multifoods, and Standard Milling.

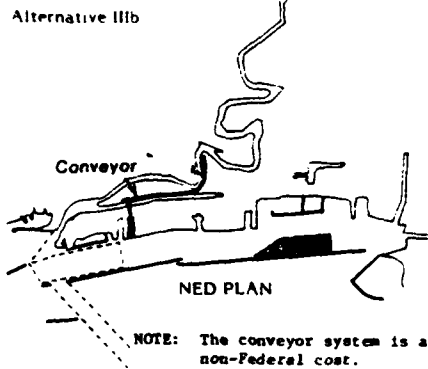


Figure 19

- IIIc. (Figure 20) The southern section of the Outer Harbor would be deepened, and ore would be transported through a slurry pipeline to Republic Steel.

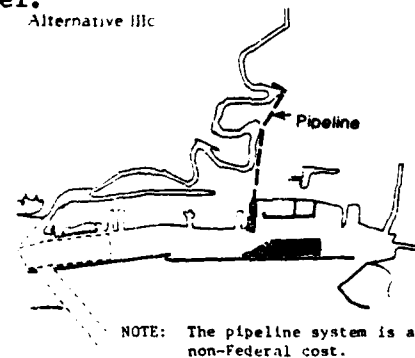


Figure 20

- IIId. (Figure 21) The southern section of the Outer Harbor would be deepened, and ore and limestone would be carried to Republic Steel by a conveyor.

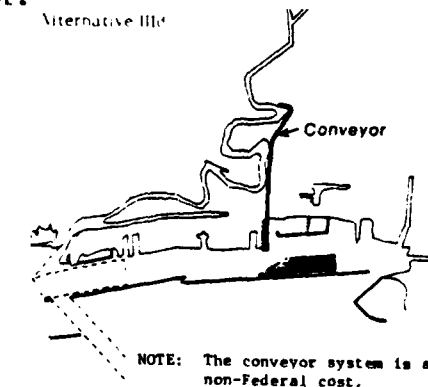


Figure 21

IIIe. (Figure 22) The southern section of the Outer Harbor would be deepened, and two barges would be used to transport limestone and iron ore upstream.

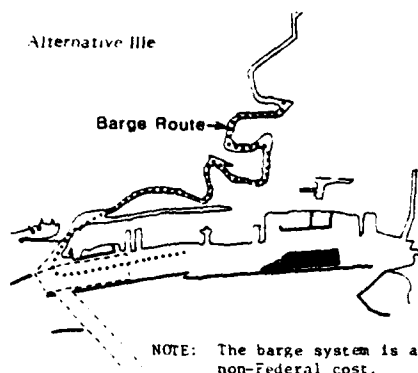


Figure 22

Cost estimates of these alternatives (Table 17) revealed costs ranging from \$4 million for Alternative IIIe to \$34 million for Alternative IIIa. Economic analyses indicate benefit to cost ratios greater than one, except Alternative IIIe. These schemes were evaluated based on Principles and Standards criteria and on original construction cost amortization of 50 years. Since a large part, if not all, of the construction costs for transshipment alternatives must be borne by private companies, more appropriate business criteria must be considered to determine the likelihood of private participation.

The best B/C ratio (4.19) for grain conveyor transshipment is Alternative IIIb. Both ore transshipment alternatives produced high B/C ratios, with the best (3.51) being for the slurry pipeline. Use of barges yielded a B/C ratio of 0.66.

There would be very little environmental impact from these alternatives. Components of these alternatives that could possibly affect physical and biological resources would include management practices to prevent spills and other accidents, actual alignment of the conveyor and pipeline systems, quality and quantity of shipments, and the ability to remove iron ore particles from the slurry before discharging wastewater into the river.

(4) Improvements to the South Entrance Channel - Alternative IV (Figure 23) involves the deepening of the southern section of the Outer Harbor, the removal of a portion of the south breakwater, widening and deepening of the South Entrance Channel, and construction of a new breakwater on the south side of the South Entrance Channel. This alternative, which would make the entrance channel safer for large vessels, was not analyzed in detail.

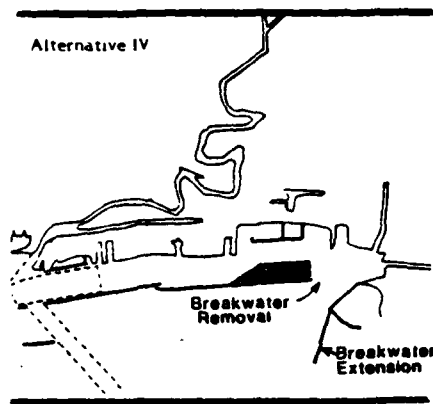


Figure 23

(5) Conclusions - On the basis of the concerns, needs, and desires expressed by local interests and the preliminary economic and environmental studies presented in Stage 1, it was concluded that all categories of improvements were feasible except for the "River Improvements for 1,000-Foot Vessels."

Alternatives recommended for Stage 2 study were as follows:

II River Improvements for 700-Foot Vessels

IIa - Deepen Buffalo River and Ship Canal

IIb - Deepen Buffalo River only

IIc - Deepen Buffalo Ship Canal only

III Transshipment from the Outer Harbor to Upriver Industrial Facilities

IIIa - Grain conveyor system

IIIb - Grain conveyor system

IIIc - Slurry pipeline for iron ore

IIId - Conveyor System for iron ore

IV Improvements to the South Entrance Channel for 1,000-Foot Vessels

IV Channel Modifications

b. Stage 2.

(1) Nonstructural Plans - Since no nonstructural solutions were identified during Stage 1, some were formulated during Stage 2, but after a

cursory review, all were found to be impractical. The specific plans that were reviewed are as follows:

(a) Ship-to-Ship Transfer - This nonstructural concept would involve delivery of ore in Class X vessels to a location in Lake Erie outside of Buffalo Harbor. The ore would then be transferred to smaller vessels capable of safely and efficiently utilizing the existing harbor.

This concept was eliminated immediately due to environmental, economic, and operational considerations. Ships in the open lake are subject to winds and waves that would make transfer of ore without spillage very difficult. The need for shifting of the smaller vessels during transfer would also greatly increase the possibility of collisions and damage to both vessels. Construction of any facilities to eliminate these problems is impractical in the open-lake area.

This concept is also impractical from an economic standpoint. It would require either three Class VI vessels to unload one Class X vessel or three trips by one Class VI vessel. If three vessels were used, the Class X vessel would not be delayed, but there would be considerable wasted time for the three Class VI vessels while waiting for the next vessel. If only one Class VI vessel were used, there would be considerable delay for the Class X vessel while waiting for the Class VI vessel to unload and return. For these reasons, this alternative was not considered further.

(b) Barging from the Originating Harbor - This concept considered interlake movement based on a barging system typically used on the inland waterway system. Direct barging of bulk materials could be accomplished with only minor change to the present harbor. Such an operation would in effect be similar to a direct vessel delivery by bulk carriers and a transfer of materials to barges for local distribution. Numerous questions regarding costs of modifying "source" harbor facilities and the efficiency and safety of barges on the open lakes were also considered in discontinuing evaluation of this alternative in its entirety.

(c) LASH Delivery from the Originating Harbor - Another possible concept for direct waterborne movement was a "lighter-aboard-ship" or LASH system similar to the Seabee system. These shipping methods utilize vessels constructed to carry lighters or barges within their hulls which are hoisted aboard the "Mother Ship" by a large gantry crane or an elevator mounted on the vessel. This shipping concept is now used at several ports on the Gulf Coast with vessels over 890 feet long and capable of carrying about 30,000 net tons of cargo. Applicability of such a shipping vehicle and system to the bulk cargo trade on the Great Lakes involves technical problems relating to the relatively high unit weights of iron ore and stone cargo. Physical changes in the configuration of the "Mother Ship" to conform to the locks and navigation channels in the Great Lakes would be required. The application of the LASH system at Buffalo would be limited to moving cargo bound for upriver locations.

(d) Railroad Car Ferry Delivery from Shipping Harbor - Another possible concept was the shipping of bulk cargoes on vessels capable of carrying

railroad cars directly, e.g., railroad car ferries, from origin harbor to Buffalo, NY. Such a system would require an inordinate number of railroad cars with the consequent deadweight. Further, the interlake movement of such a system could be hazardous during storm conditions.

Major terminal changes to handle the railroad cars would be required at both the origin and destination harbors. This alternative was not considered further.

(e) Rail from Source - A fifth alternative was an all-rail movement of iron ore from Lake Superior to Buffalo. Because of the significantly higher cost for direct rail movement when compared to movement by bulk cargo vessels, this alternative was eliminated from further consideration.

(f) Tractor-Trailer Delivery from Source - A sixth alternative analyzed cursorily, but eliminated, was direct tractor-trailer delivery of iron ore from source to consuming plant.

This alternative mode of iron ore delivery was deemed unlikely because of the large number of trucks involved, the impacts of high traffic volumes, upgrading, and maintenance along the haul route and increased fuel consumption. Further, the preliminary cost calculations indicated that the costs would be significantly greater than by bulk cargo vessels.

(g) Rail Transshipment from Another Lake Erie Port - Two alternatives for transshipping iron ore from other Lake Erie ports were considered and then eliminated. One included vessel delivery of iron ore to another Lake Erie port and then transshipment to Buffalo by rail. The ports of Toledo, Huron, Lorain, Ashtabula, and Conneaut all have docks engaged in transshipping iron ore to inland plants and could have handled iron ore destined for Buffalo. All of these harbors had depths commensurate with the Great Lakes Connecting Channels and the St. Lawrence Seaway and rail connections to Buffalo.

While this alternative would be economically viable, there would be an overland rail charge and extra handling costs in addition to the vessel delivery costs which is common to all Lake Erie ports. In addition, the Buffalo plants were not equipped to receive large tonnages by rail, thereby requiring substantial investments in new facilities to modify the existing rail system.

Because of the additional rail haul and handling charges and the investments necessary to receive and handle large tonnage, it appeared that transshipment of significant tonnages through other ports would probably not develop and thus, this alternative was eliminated from further consideration.

(h) Tractor-Trailer Transshipment from Another Lake Erie Port - This is a variation of the previous alternative using tractor-trailers in lieu of rail delivery from other Lake Erie harbors. Undesirable aspects of this alternative included inherent traffic congestion, and required upgrading and increased maintenance of haul routes. Further, the added cost of transshipment would in effect offset the lake leg savings that could be made possible by delivering iron ore to a remote harbor in vessels more efficient and

economical than those which could navigate the Buffalo River. As a result, this alternative was eliminated from further consideration.

(2) Structural Plans - Since no feasible nonstructural alternative was identified during the initial phase of Stage 2, full attention was focused on the feasible Stage 1 structural alternatives and the formulation of some new structural alternatives that may have been overlooked in Stage 1.

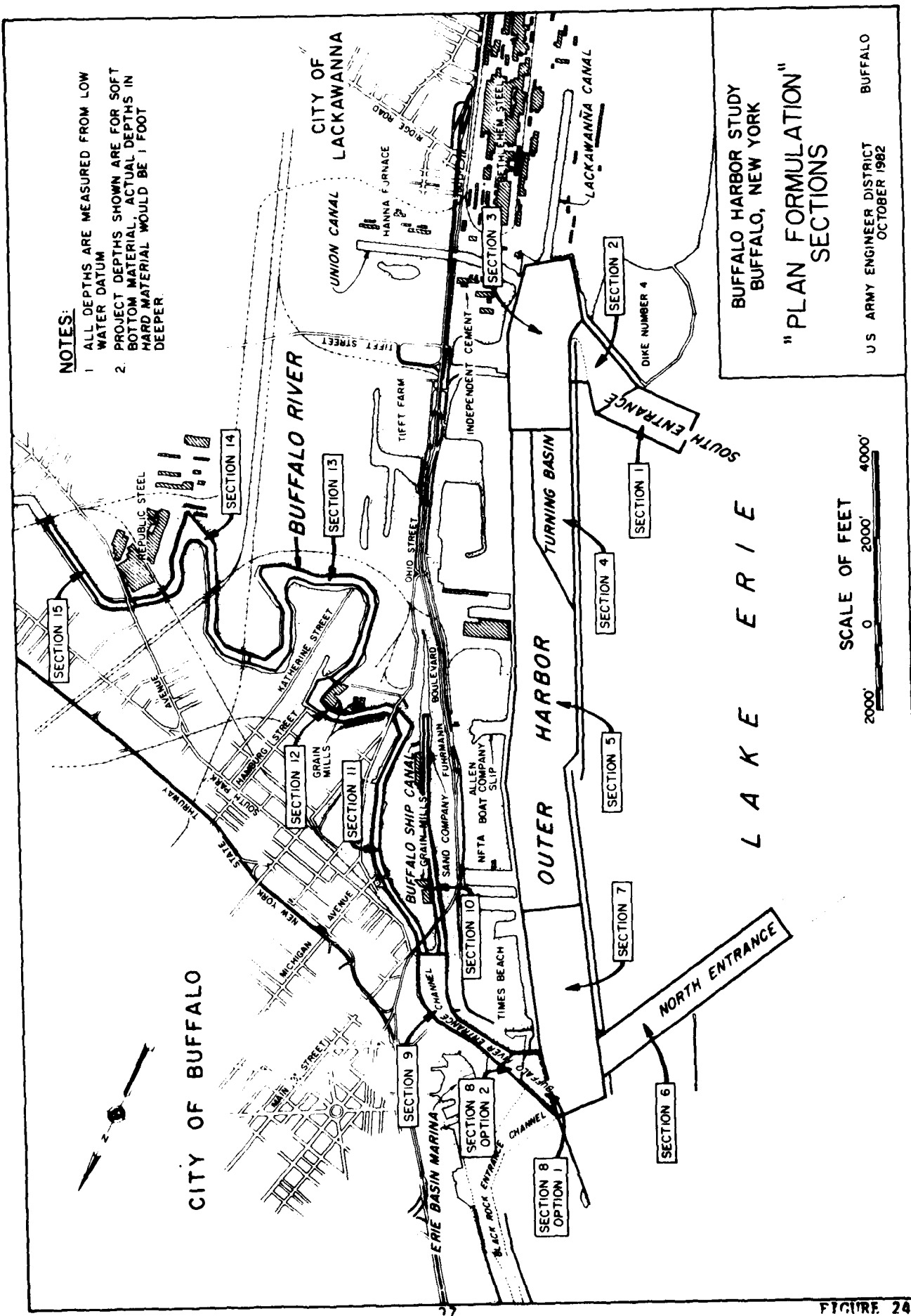
A second look at the feasible Stage 1 alternatives found the following;

(a) River Deepening for 700-Foot Vessels - Alternatives IIa, IIb, and IIc were determined to be economically unjustifiable based on a more comprehensive cost estimate and a slightly more conservative estimate of the benefits. This conclusion set off a search for a viable river deepening plan for 700-foot vessels. The methodology that was employed broke the entire harbor into sections (see Figure 24). Then the preliminary cost for each section was computed as well as the preliminary benefits. This was done for two different operating drafts, 22.5 feet and 25.5 feet. In addition to varying the required draft, the selection of an entrance channel (north or south) also was varied. The final step consisted of mixing and matching the sections, drafts, and entrance channel choices to find a viable deepening plan.

This resulted in a preliminary screening of approximately 33 plans including a reevaluation of Alternatives IIa, IIb, and IIc. This analysis concluded that only two river deepening plans might be economically justifiable. These were named Alternative IIId and IIe. A complete description of these alternatives as well as an overall assessment and evaluation are presented in the next section of this report, "Section IV."

(b) Transshipment from the Outer Harbor to Upriver Industrial Facilities - Three of the four alternatives were found to be impractical from an industry standpoint. These included plans IIIa and IIIb which were designed to move grain from the Outer Harbor by conveyor to the upriver grain facilities, and Plan IIIc which was designed to move iron ore from the Outer Harbor by slurry pipeline upriver to Republic Steel.

Potential problems that were cited by personal interviews with representatives of the grain industry during Stage 2 regarding Alternatives IIIa and IIIb were: (1) the high initial first cost that would have to be borne by the grain industry for the conveyor system; the sanitation precautions that would be needed to move grain over such a long distance (+4,000 feet); and the coordination of usage and maintenance by the five millers. Their common response was that they wanted to know if a similar system was in existence today and, if so, how did this facility mitigate their concerns. This resulted in an extensive search of the United States by the Buffalo District to find a similar system; i.e., a grain conveyor system approximately 4,000 feet long with several users. During this search, the Buffalo District contacted other Corps Districts, grain milling companies, conveyor manufacturers, and consultants specializing in conveyor systems. The District also tapped into its national computerized library network to search for written material on this concept. The end result of this search was that no comparable system was found. Most grain conveyors are 500 to 1,500 feet



long and are used by only one company. The longest system that was found was approximately 2,600 feet long, but the accuracy of this figure was later cast in doubt by another source. In either event, this facility was only serving one company. Thus, Alternatives IIIa and IIIb were dropped from further consideration. Another grain transshipment idea that was considered but eliminated for economic reasons was the utilization of the Cargill Pool elevator as a lightering facility for grain vessels.

Potential problems that were identified through a personal interview with a Republic Steel representative regarding Alternative IIIc, the slurry pipeline system to move iron ore, were: (1) slurry pipelines are practical only over long distances, (2) this type of system requires large areas of land and great quantities of water, and (3) the iron ore pellets probably would have to be pulverized to travel through the pipeline. Based on these concerns, this plan was dropped from further consideration.

Alternative IIId, a conveyor system to move iron ore to Republic Steel was the only transshipment plan from Stage 1 to survive this initial screening by industry representatives. On this basis, a number of variations were considered using the conveyor concept for iron ore. These included adding a spur to Hanna Furnace onto Alternative IIId, and three new plans. One moved the conveyor from NFTA property to the north side of the Union Ship Canal. Under this plan, the conveyor would only service Republic Steel, but Hanna Furnace would benefit from the improvements that would be made to the Union Ship Canal. Another plan that was considered had the conveyor system originating at Independent Cement running directly to Republic Steel with two variations; one which included a spur to Hanna Furnace and one which eliminated the section of conveyor to Republic, but kept the spur to Hanna using a more direct route. The preliminary Stage 2 economic screening which is more comprehensive than Stage 1, concluded that almost all of the conveyor plans were not feasible and that when the few remaining feasible plans were compared to other modes of transshipment such as rail and shuttle vessel, they too fell by the wayside due to the greater cost efficiency of these other two modes of delivery. Alternatives IIIf, IIIg, IIUh, and IIIi represent the best rail and shuttle vessel alternatives that were developed. They are discussed in detail in the next section of this report.

One other mode of transshipment that was considered during this initial screening was truck. This was eliminated rather quickly based on its low economic efficiency, which was the lowest of the four modes considered, and the inherent operational and maintenance problems involved in the movement of large quantities of materials over city streets.

(3) Improvements to the South Entrance Channel - After an initial Stage 2 screening, it was decided that Alternative IV was still a viable plan, but it needed to be broken down into two separate plans with some modifications made to the original design features. These plans are referred to in Section IV as Alternatives IVa and IVb.

SUMMARY

During this initial Stage 2 screening of alternatives from Stage 1 and concepts developed during Stage 2, a total of 54 alternatives were considered. These included three Stage 1 deepening plans and 32 new deepening plans, four Stage 1 transshipment plans and 12 new ones, and one Stage 1 South Entrance Channel improvement plan and two new variations of it. The results of this work were the identification of eight plans (two deepening, four transshipment, and two South Entrance Channel options) that were recommended for full Stage 2 study. The remainder of this report represents the results of that work.

PLANS OF OTHERS

The most significant development in recent months regarding the Buffalo Waterfront has been the formation of the Buffalo Waterfront Planning Board. Its membership includes all the prominent organizations and political interests in the Buffalo area with an interest in the waterfront. The goal of the board is to develop a master plan for the future development of Buffalo's waterfront. This effort is intended to look at all aspects of waterfront development, including port activities, industry, recreation to include boating, and residential uses. The boundaries for this planning effort include the Buffalo Harbor area, including the Buffalo River and the Niagara River shoreline. As part of this process, the board will serve as a coordinating agency for all waterfront studies so that they will better mesh with its overall goals and objectives.

The formation of this Board has recently resulted in the expansion of the Buffalo Harbor study area to include the Niagara River shoreline of the city of Buffalo. Additionally, greater consideration will be given to recreational opportunities during the later phases of the Buffalo Harbor Study.

OTHER STUDIES

In the May 1981 Buffalo Harbor Revitalization Study, there were four recreation-related measures identified that the Corps of Engineers could be a participant in and that could contribute to the harbor revitalization effort. These four measures are; creation of offshore islands, development of the NFTA small-boat harbor, development of a marina between the Cargill Pool Elevator and the dike disposal facility adjacent to the NFTA Small-Boat Harbor, and removal of drift and debris from harbor waters. Three of these four measures are examined in a very preliminary manner in the paragraphs below. The fourth measure, drift and debris removal, was given a much more in-depth examination. The investigation is summarized below, while the details appear in Appendix I.

a. Creation of Offshore Islands

This measure consists of creating an offshore island somewhere in the Buffalo Harbor. The island would be made by building an armored perimeter and then filling the inside with slag or dredged material from the Buffalo River.

The island was assumed to be 100 acres in size and circular with a pond or beach near the center.

Preliminary benefit-to-cost ratios were developed for the offshore island concept. The main activities on the island were assumed to be picnicking, fresh water swimming, fishing and boating (boat marina). Although the island was not specifically sited, it can be safely assumed that the island will be within depths of water between 10 and 30 feet. Thus, a rough cost estimate was developed for both depths using two different types of fill material. One was dredged material from maintenance dredging and the other was slag. The benefit-to-cost ratios are shown in Table 18.

Table 18 - Benefit and Cost Summary for Creation of an Offshore Island

Depth of Water	10 Feet		30 Feet	
	Construction w/ Slag Fill	Construction w/ Dredge Material	Construction w/ Slag Fill	Construction w/ Dredge Material
	\$	\$	\$	\$
Total Estimated:				
Average Annual Benefits	1,878,800	1,878,800	1,878,800	1,878,800
Total Average Annual Costs	5,915,000	2,848,000	15,116,000	5,551,000
Net Benefits	-4,036,200	-969,200	-13,237,200	-3,672,200
Benefit/Cost Ratio	0.32	0.66	0.12	0.34

In terms of wind protection for shoreline development, a 100-acre treed island located lakeward of the Outer Harbor breakwater probably would do little to mitigate the winds reaching the mainland. Even a much larger island this far from the shoreline probably would do little to protect the mainland from the severe winds of the area.

From an environmental standpoint, the actual siting of such an island would have to take into consideration that there are several environmentally sensitive areas in the harbor. These include the Fish Market along the Bird Island Pier, Donnelly's Walls near the Horseshoe Reef, and most of the shallow embayments along Route 5.

Additional information regarding the preliminary engineering and economic evaluation can be found in Appendices A and B, respectively.

b. NFTA Small-Boat Harbor.

Upon preliminary examination of the problems at the small-boat harbor it was determined that it qualify for assistance from the Corps of Engineers under Section 107 of the River and Harbor Act of 1960. Thus a reconnaissance study under the authority of Section 107 was initiated in October 1982.

The NFTA Small-Boat Harbor was constructed in the early 1950's. The dike structure was built using slag material and when initially constructed consisted of a 1,000-foot long lakeward (westerly) extension from its shore connection to a point where it turned sharply to a northerly direction and extended about 2,000 feet where it then doglegged and extended lakeward in a westerly direction for about 400 feet. The plan showing the layout of the NFTA Small-Boat Harbor as originally constructed is shown on Plate A6, of Appendix A.

In the latter 1960's, modifications to the northerly end of the NFTA small-boat harbor dike were made. The modifications entailed removal of the existing 400-foot long dogleg extension, removal of about 800 feet of dike from the existing northernmost end of the 2,000-foot long south-north extension, thereby shortening the dike to about 1,500 feet, and construction of a new 400-foot long dogleg extension in a landward (easterly) direction. This plan showing the existing layout of the NFTA small-boat harbor is shown on Plate A7, of Appendix A.

The widening of the gap between the end of the NFTA small-boat harbor and the adjacent dock allows the waves to propagate directly into the dockage and mooring areas. Wave activity was not a problem before the realignment of the dike, therefore realignment of the dike to its original configuration should be adequate to eliminate the undesirable wave conditions. The NFTA small-boat harbor is discussed in more detail in Section A23 of Appendix A.

c. Development of A New Marina Adjacent to the Cargill Pool Elevator.

The Corps of Engineers decided not to do a specific study of the feasibility of a marina in the vicinity of the Cargill Pool Elevator, but rather developed an overall demand for boating in the Buffalo area, thereby establishing how much of a need there is for constructing such facilities.

The primary objective is to obtain the necessary field data to define existing conditions for boating activity in the region and to establish an adequate data base for a detailed demand analysis and benefit evaluation in the next stage of study. Analyzing user demand for permanent berths within the study area is necessary for the evaluation of potential expansion of boating facilities at Buffalo. A discussion of this analysis is presented in Section B10 of Appendix B.

d. Drift and Debris Removal Study.

Part of the authority for the Buffalo Harbor Study requires a review of previous reports on Buffalo Harbor. One of these reports concerned the feasibility of establishing a Federal project for the removal of drift in the Harbor and adjacent waterways. Permission was obtained to reactivate that study under the authority of the Buffalo Harbor Study. The following paragraphs are a brief summary of the Drift and Debris Removal Study which appears as Appendix I in this report.

The purpose of the Drift and Debris Removal Study is to determine the feasibility of establishing a Federal project for the collection, removal, and

disposal of drift in Buffalo Harbor and the adjoining waterways. The study will also investigate the feasibility of removing the sources of drift. The major sources of drift which have been identified are tributary drift from the Buffalo River, abandoned buildings, docks, piers, and loose onshore debris.

The problem with drift in the Buffalo Harbor is that it constitutes a menace to small boat navigation. Boat operators must exercise care in navigating the waterways to avoid striking the drift. The greatest difficulty for small-boat navigation is experienced at night or during fog conditions when the drift is difficult to see.

There were four alternative solutions identified in the early stages of the study. These four alternative solutions are presented below:

Alternative I. This is the no-action alternative. The base case against which all the other alternatives may be compared.

Alternative II. Establish a program for the continuous annual removal of drift in the harbor during the boating season.

Alternative III. Implement a one-time cleanup program to rid the harbor of the major structural sources of drift. These sources have been identified in field surveys and consist of dilapidated waterfront structures, loose onshore debris, sunken vessels, and tributary drift.

Alternative IV. Combine Alternatives II and III; i.e., implement a one-time cleanup and then have a continuous annual program for the removal of drift as it enters the harbor.

The Drift and Debris Removal Study investigated the feasibility of each of these alternative solutions based on technical, economic, social, and environmental criteria, and found that Alternative III was the only plan to be economically justified. Thus, this alternative which calls for a one-time cleanup program to rid the harbor of the major structural sources of drift will be carried forward into Stage 3 study.

e. Cumulative Effects.

Findings of these and other harbor-related studies and/or developments will be considered and any cumulative impacts will be incorporated into the final Buffalo Harbor Navigation Improvement Feasibility Study Report and Environmental Impact Statement (EIS).

SECTION IV

ASSESSMENT AND EVALUATION OF PRELIMINARY PLANS

This section provides a summary of the engineering design, economic evaluation, and environmental assessment of the eight structural plans that an initial screening of a wide range of possible solutions indicated had the greatest potential for meeting the planning objectives of promoting the economical movement of bulk cargo through Buffalo Harbor. These alternatives are:

River Deepening Plans

- Alternative Plan IIId - Deepen the Buffalo River and Buffalo Ship Canal to 25 feet and use the North Entrance.
- Alternative Plan IIe - Deepen the Buffalo River and Buffalo Ship Canal to 25 feet and use the South Entrance.

Lakefront Transshipment Plans

- Alternative Plan IIIf - Shuttle Vessel from NFTA.
- Alternative Plan IIIg - Rail from NFTA
- Alternative Plan IIIh - Rail from Independent Cement.
- Alternative Plan IIIi - Shuttle Vessel from Independent Cement.

South Entrance Channel Improvement Plans

- Alternative Plan IVa - Improve the South Entrance Channel and deepen the middle and southern portion of the Outer Harbor.
- Alternative Plan IVb - Improve the South Entrance Channel and deepen the southern portion of the Outer Harbor.

Appendices A through E to this report provide details of the engineering and economic analyses associated with the eight structural alternatives for which preliminary designs were prepared. These appendices are:

- Appendix A - Coastal Engineering Design.
- Appendix B - Economic Evaluation.

Appendix C - Design.

Appendix D - Cost Estimates.

Appendix E - Geotechnical.

RIVER DEEPENING PLANS (PLANS IIId and IIe)

The primary purpose of the Buffalo River modification plans is to increase the efficiency, and thus decrease the transportation cost, of the vessels currently using the navigation channel. In this regard, plans were developed to deepen the navigation channel to partially or totally eliminate the need to traverse the channel light-loaded.

All river deepening plans were developed based on the assumption that all dredged material is polluted and would be placed in Dike Site 4 which has excess capacity over and above the authorized 10-year life due to lower than expected volumes from annual maintenance dredging. In addition, due to lack of sufficient environmental data, mitigation plans to compensate for unavoidable negative environmental impacts of the alternatives were not formulated in Stage 2. Mitigation will be evaluated in Stage 3, as appropriate.

Pertinent engineering, economic, environmental, and related data for Plans IIId and IIe follow.

a. Alternative Plan IIId - Deepen the Buffalo River and Buffalo Ship Canal to 25 Feet and Use the North Entrance Channel.

(1) Description of Plan IIId - Plan IIId (see Figure 25) consists of deepening the North Entrance Channel, the Buffalo River and Buffalo Ship Canal. Other major components include the removal of three abandoned buildings along the river and the replacement of several thousand feet of bulkheading. The purpose of the plan is to allow the grain industry to safely use the full draft of their vessels. Buffalo's grain fleet requires 21.1 feet of draft to fully load their vessels, but the present channel only provides 19.5 feet under Corps design criteria.

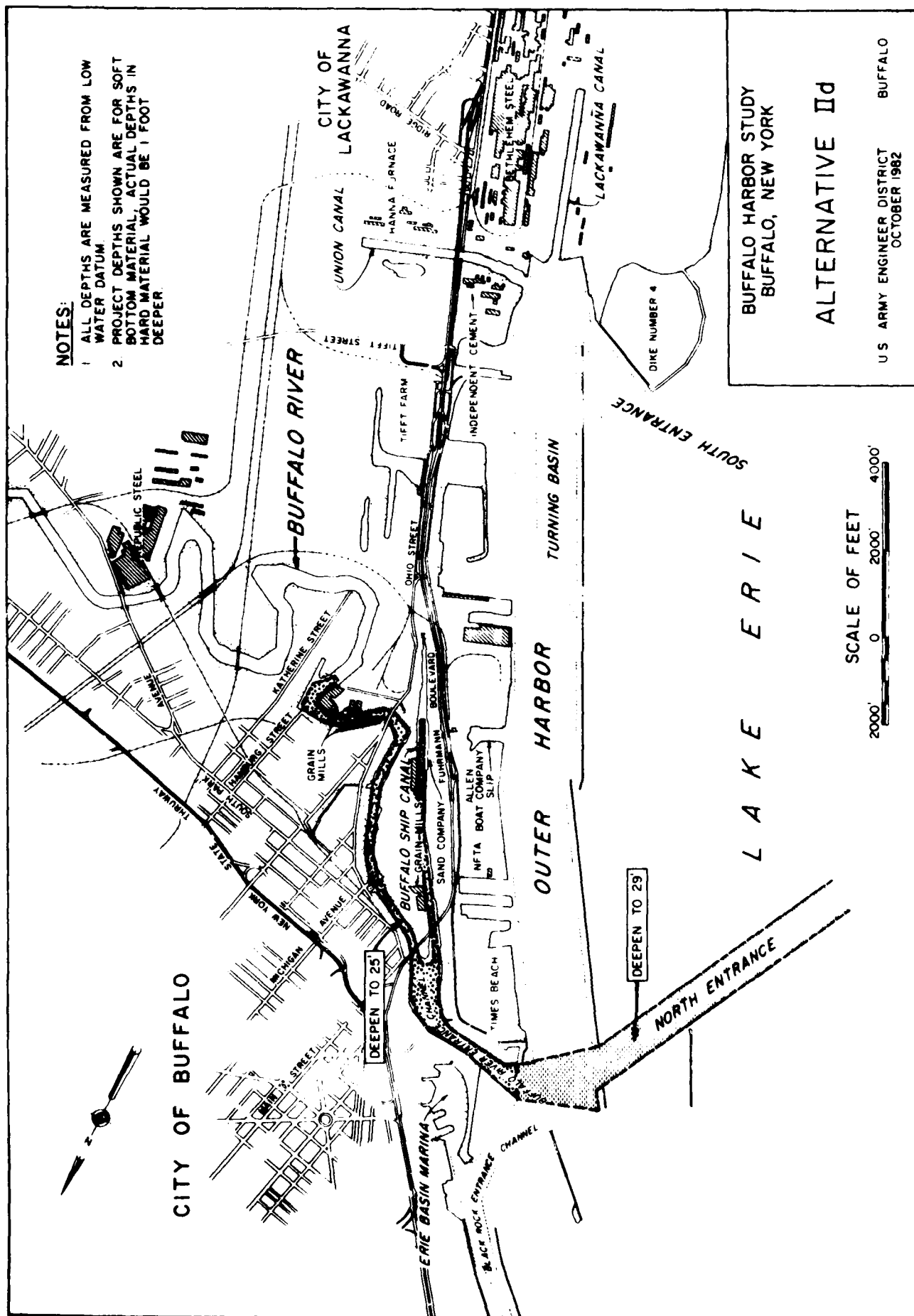
The specific features of this plan are:

(a) Deepen the North Entrance Channel, the northern portion of the Outer Harbor, and a portion of the Buffalo River Entrance Channel to 29 feet.

(b) Deepen the remainder of the Buffalo River Entrance Channel, the Buffalo Ship Canal, and the Buffalo River to the upper limit of the grain industry (International Multifoods) to 25 feet.

(c) Replace 4,500 feet of the existing bulkheads on the Buffalo River and 2,500 feet on the Buffalo Ship Canal that would become unstable due to channel deepening.

(d) Demolish two abandoned grain mills and the Ganson Street Warehouse on the Buffalo River.



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BUFFALO, NEW YORK

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U S ARMY ENGINEER DISTRICT
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(e) Provide protection to the Skyway Bridge piers with the construction of 800 feet of new bulkheading and 320 feet of fender system. The Skyway Bridge spans the Buffalo River and Ship Canal.

(f) Provide protection to the Michigan Avenue Bridge piers with 160 feet of new bulkheading and 160 feet of fender system. This bridge spans the Buffalo River.

(g) Relocate several utilities in the Buffalo River and Buffalo Ship Canal.

(2) Cost Estimate for Plan IId. The detailed cost estimate for Plan IId is presented in Appendix D. Tables 20 and 21, following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs under both, the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IId is \$82,912,000 (Table 20) and the total investment cost, including interest during construction, is \$91,341,800 (Table 21). The total annual charges are \$7,503,000.

(3) Economic Evaluation of Plan IId - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IId is presented in Appendix B, "Economic Evaluation."

All of the grain mills: International MultiFoods, Pillsbury, American Malting, Peavey, and General Mills on the Buffalo River and Ship Canal would benefit from this plan. Another beneficiary of this plan would be Founder's Sand Supply, which is the sole receiver of sand in the Inner Harbor. Under this plan, they would be able to utilize 22.5 feet of the 25.5 feet of draft available on the Great Lakes St. Lawrence Seaway System.

Table 19, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IId. Net commercial navigation benefits are -\$4,924,000 annually and the B/C ratio is 0.34.

Table 19 - Summary of Benefits and Costs for Alternative Plan IId (1)

	: Average	:	Average	:	Net Average	:
	: Annual	:	: Annual	:	: Annual	: Benefit/Cost
	: Benefits	:	: Charges	:	: Benefits	: Ratio
	: \$:	: \$:	: \$:
Total Project	: 2,579,000	:	: 7,503,000	:	: -4,924,000	: 0.34
	:	:	:	:	:	:

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IId - Dredging, to deepen the existing channel, would destroy the existing benthos located in the excavated areas as well as disperse fish from the immediate work zone. Neither

Table 20 - Estimate of Total Project Cost for Alternative Plan IId
(June 1982 Price Levels)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
		\$	\$	\$	\$
1. Dredging	5,990,700	5,990,700	-	-	5,990,700
2. Rock Excavation	25,597,600	25,597,600	-	-	25,597,600
3. New Bulkheads/ Bulkhead Replace	20,619,200	-	0,619,200	-	20,619,200
4. Bridge Fenders	558,800	-	558,800	-	558,800
5. Demolition of Buildings	5,305,500	-	5,305,500	-	5,305,500
6. Relocation of Utilities	99,000	-	99,000	-	99,000
7. Mobilization and Demobi- lization	370,000	370,000	-	-	370,000
Subtotal	58,540,000	31,958,300	26,582,500	-	58,540,800
8. Contingencies (20 Percent +)	11,659,200	6,341,700	5,317,500	-	11,659,200
Subtotal	70,200,000	38,300,000	31,900,000	-	70,200,000
9. Engineering and Design	6,200,000	3,300,000	2,900,000	-	6,200,000
10. Supervision and Admini- stration	6,400,000	3,500,000	2,900,000	-	6,400,000
Subtotal	82,800,000	45,100,000	37,700,000	-	82,800,000
11. Lands and Damages	112,000	-	112,000	-	112,000
Total Project Cost:	82,912,000(1)	45,100,000(1)	37,812,000(1)	-	82,912,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IId. Mitigation would have been evaluated in Stage 3, if this plan would have been carried forward.

Table 21 - Estimated Investment Cost and Annual Charges for Alternative Plan IId
(June 1982 Price Levels)(1)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
		\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	82,800,000	45,100,000	37,700,000	-	82,800,000
Interest During Construction (2)	8,429,800	4,680,600	3,749,200	-	8,429,800
Lands and Damages	112,000	-	112,000	-	112,000
Total Investment, Including Lands	91,341,800	49,780,600	41,561,200	-	91,341,800
Annual Charges for the Project					
Interest	6,964,800	3,795,800	3,169,000	-	6,964,800
Amortization	181,800	99,100	82,700	-	181,800
Additional Main- tenance	356,400	356,400	-	-	356,400
Total Annual Charges	7,503,000	4,251,300	3,251,700	-	7,503,000

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 3-year construction period.

of these impacts is expected to cause significant adverse impacts since benthic organisms would be expected to drift or move back into the construction areas once dredging is completed. Displaced fish would migrate back into the work area after dredging was completed and turbidity returned to pre-dredging conditions.

Temporarily, water quality would be impaired due to dredging and bulkhead construction and removal. Construction activity would resuspend some bottom sediments and cause some minor shoreline erosion. The resuspension of sediments could cause the release of toxins back into the water column having detrimental effects to the aquatic communities of the area. These adverse effects would continue until the resuspended particulates settled out. The shoreline erosion would only be expected to cause a minor increase in turbidity. Also, it is inevitable that fuels, grease and oils from construction equipment would spill into the water causing a lowering of water quality. These impacts are expected to be minor and temporary.

Deepening of the Buffalo River and Ship Canal to 25 feet will support area business and industry, as the grain mills and sand supply company will be able to bring in the maximum size vessel (Class 5-639 feet X 72 feet) that can move through the river and channel, or more fully loaded. This increase in efficiency per trip may preserve the very slender margin of competitive advantage that the mills have been operating under.

Any action which will ensure that the grain mills can continue to operate will support current local levels of employment, which in a period of rapidly rising unemployment becomes an important objective. In addition, river, canal and entrance channel improvements will increase safety for vessels using the waterway.

Demolition of the Ganson Street Warehouse and two abandoned grain mills removes a safety hazard and is, in effect, site preparation. That is, the property becomes more valuable to the city, the current owner, and prospective buyers because it will be ready for re-use. This increases the property's value and in time could increase tax revenues if the land is purchased and then begins to return taxes to the city once again.

Deepening the river and channel and replacing bulkheading and fenders does support existing land use in the area, i.e., industrial and in that respect influences future land use, which is subject to conflicting demands as described in the Existing Conditions section. The demolition and bulkhead and fender improvements could be said to improve area aesthetics, and the general appearance of the area will not be significantly altered.

Several utility lines will have to be uncovered and replaced deeper to allow for greater channel depths. Utility line replacement and building demolition will require coordination with the city and the various utility companies involved.

In general, these improvements are consistent with local plans for community and regional growth. There are many who have proposed other than industrial uses for the harbor area but there is general agreement on preserving

existing area industry. Any future plans will be coordinated with the newly created Waterfront Planning Board. Because this alternative is generally consistent with community goals, it could result in a slight increase in community cohesion as the area's population see that the Federal Government is continuing to support the overall goal of revitalization and people see that something is actually being done. This is not to say that all people will find this alternative satisfactory.

There will be no displacement of people or farms as a result of this or any other of the proposed alternative plans.

There will be no significant impacts on recreation or noise as a result of this alternative.

(5) Conclusions - Although Plan IIc would provide benefits to the grain and sand industries of Buffalo without any major adverse environmental impacts, it is not economically justified with a B/C ratio of 0.34 and net average annual benefits of -\$4,924,000. It is, therefore, concluded that Plan IIc should be eliminated from further consideration.

b. Alternative Plan IId - Deepen the Buffalo River and Buffalo Ship Canal to 25 Feet and Use the South Entrance Channel

(1) Description of Plan IId - Plan IId (see Figure 26) calls for improvements to the South Entrance Channel (alteration of the breakwaters and deepening of the channel), and deepening of the Outer Harbor and a portion of the Inner Harbor. The other major components associated with this plan are the same as Plan IIc. The purpose of this plan is to allow the steel and grain industries to safely use the full draft of their vessels and to eliminate some unsafe conditions at the South Entrance. The limit of this plan's influence on the efficiency and safety of the steel industry is the southern end of Times Beach. Beyond this point, all plan elements are designed to assist the grain industry.

Buffalo Harbor's iron ore carriers have a maximum operating draft of 25.5 feet, but the South Entrance that is used by the steel industry only provides 22.5 feet. The South Entrance also poses a safety problem for all vessels because of its configuration. Specifically, the clearance between the two breakwater points as you enter the Outer Harbor is insufficient. Moreover, during periods of high winds, there is an unacceptable level of wave activity in the area.

Buffalo Harbor's grain fleet requires 21.1 feet of draft, but the channel network from the southern end of Times Beach to the grain mills only provides 19.5 feet after taking into consideration squat and safety factors.

The specific features of this plan are:

(a) Deepen the South Entrance to 32 feet.

(b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be

constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.

(c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.

(d) Deepen the southern portion of the Outer Harbor to 30 feet.

(e) Deepen a portion of the Outer Harbor Turning Basin and all of the middle portion of the Outer Harbor to 28 feet.

(f) Deepen the northern portion of the Outer Harbor and a portion of the Buffalo River Entrance Channel to 27 feet.

(g) Deepen the remainder of the Buffalo River Entrance Channel, the Buffalo Ship Canal, and the Buffalo River to the upper limit of the grain industry (International Multifoods) to 25 feet.

(h) Replace 4,500 feet of the existing bulkheads on the Buffalo River and 2,500 feet on the Buffalo Ship Canal.

(i) Demolish two abandoned grain mills and the Ganson Street Warehouse on the Buffalo River.

(j) Provide protection to the Skyway Bridge piers with the construction of 800 feet of new bulkheading and 320 feet of fender system. The Skyway Bridge spans the Buffalo River and Ship Canal.

(k) Provide protection to the Michigan Avenue Bridge piers with 160 feet of new bulkheading and 160 feet of fender system. This bridge spans the Buffalo River.

(l) Relocate several utilities in the Buffalo River and Buffalo Ship Canal.

(2) Cost Estimate for Plan Iie - The detailed cost estimate for Plan Iie is presented in Appendix D. Tables 22 and 23, following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan Iid is \$83,912,000 (Table 22) and the total investment cost, including interest during construction, is \$92,817,900 (Table 23). The total annual charges are \$7,651,400.

(3) Economic Evaluation of Plan Iie - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan Iie is presented in Appendix B, "Economic Evaluation."

All three of the iron ore users: Bethlehem, Republic, and Hanna furnace would benefit from this plan. Bethlehem Steel would be able to safely fully

Table 22 - Estimate of Total Project Cost for Alternative Plan Iie
(June 1982 Price Levels)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
1. Dredging	9,804,800	9,609,200	195,600	-	9,804,800
2. Rock Excavation	13,146,600	11,685,900	1,460,700	-	13,146,600
3. Breakwater Demolition	1,619,500	1,619,500	-	-	1,619,500
4. Breakwater Construction	7,693,400	7,693,400	-	-	7,693,400
5. Bulkheading	20,619,200	-	20,619,200	-	20,619,200
6. Bridge Fenders	558,800	-	558,800	-	558,800
7. Demolition of Buildings	5,305,500	-	5,305,500	-	5,305,500
8. Relocation of Utilities	99,000	-	99,000	-	99,000
9. Mobilization and Demobi- lization	370,000	370,000	-	-	370,000
Subtotal	59,216,800	30,978,000	28,238,800	-	59,216,800
10. Contingencies (20 Percent +)	11,883,200	6,222,000	5,661,200	-	11,883,200
Subtotal	71,100,000	37,200,000	33,900,000	-	71,100,000
11. Engineering and Design	6,300,000	3,300,000	3,000,000	-	6,300,000
12. Supervision and Admini- stration	6,400,000	3,400,000	3,000,000	-	6,400,000
Subtotal	83,800,000	43,900,000	3,000,000	-	83,800,000
13. Lands and Damages	112,000	-	112,000	-	112,000
Total Project Cost	83,912,000(1)	43,900,000(1)	40,012,000(1)	-	83,912,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan Iie. Mitigation would have been evaluated in Stage 3 if this plan would have been carried forward.

Table 23 - Estimated Investment Cost and Annual Charges for Alternative Plan Iie
(June 1982 Price Levels)(1)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	83,800,000	43,900,000	39,900,000	-	83,800,000
Interest During Construction (2)	8,905,900	5,141,700	3,764,200	-	8,905,900
Lands and Damages	112,000	-	112,000	-	112,000
Total Investment, Including Lands	92,817,900	49,041,700	43,776,200	-	92,817,900
Annual Charges the Project					
Interest	7,077,300	3,739,400	3,337,900	-	7,077,300
Amortization	184,700	97,600	87,100	-	184,700
Additional Main- tenance	389,400	389,400	-	-	389,400
Total Annual Charges	7,651,400	4,226,400	3,425,000	-	7,651,400

(1) 7-5/8 percent interest rate, 50-year life (i = .07625, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 3-year construction period.

load the Class X vessels to 25.5 feet that they use to transport iron ore to their Lackawanna Plant. Republic and Hanna would continue their lightering operation at NFTA using Class V and VII vessels, but they would now be able to safely bring vessels loaded to 25.5 feet to the NFTA dock. The current lightering operation consists of removing a portion of their load, which is later trucked to their mill. This allows them to travel through the more shallow waters of the Buffalo River or the Union Canal to reach their destination. Others who would benefit from the steel industry improvements would be the bulk commodity vessels which unload at NFTA, the Port Authority. Under this plan they would be able to safely fully utilize the system's 25.5-foot draft. Also, the greater maximum operating draft in the Outer Harbor as compared to the Buffalo River and Union Canal indicates that in the future Hanna and Republic may lighter limestone as they now do with iron ore. Therefore, limestone transportation savings would be applicable to this plan.

The benefits for the grain and sand industries are the same as Plan IId.

Table 24, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IId. Net commercial navigation benefits are -\$736,600 annually and the B/C ratio is 0.90.

Table 24 - Summary of Benefits and Costs for Alternative Plan IId (1)

	: Average	: Average	: Net Average	:
	: Annual	: Annual	: Annual	: Benefit/Cost
	: Benefits	: Charges	: Benefits	: Ratio
	: \$: \$: \$:
Total Project	: 6,914,800	: 7,651,400	: -736,600	: 0.90
	:	:	:	:

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IId - Project features of this alternative are very similar to those of IId. However, extensive dredging to deepen the South Entrance Channel, Outer Harbor, Lackawanna Canal, Ship Canal, and Buffalo River make the magnitude of impacts greater. Major physical and biological parameters affected would be benthos, fisheries, and water quality. These factors would be affected adversely as with Alternative IId, only temporarily, and impacts should moderate after construction is complete.

Some benthic and fish habitat will be lost with the removal of 750 feet of breakwater. This should not be significant since double this amount will be reconstructed in the area of the South Entrance Channel. This additional breakwater, even though it will cover some bottom area destroying the benthos, will provide additional irregular shaped stone which should provide a more valuable and stable habitat for the attachment of benthic organisms. Also, the interstices of the breakwater stones would provide an area for young fish to have cover within and increase the area which the benthos could attach thus providing an increased source of fish food. The top of the new breakwater will provide some wildlife benefit. This increased

surface area would provide additional area for nesting and resting water fowl and shorebirds and could provide increased food supply due to the influx of additional benthos and fish.

The primary beneficial impacts of this alternative are for the Buffalo Harbor area business and industry. This is the only alternative which benefits both steel and grain industries and the Port of Buffalo. These benefits would come from increased depths in almost the entire Outer Harbor and in the Lackawanna Canal, the Ship Canal, the Buffalo River and the South Entrance Channel. Deepening will allow more efficient use of the vessels' capacity, safer transits due to improved channels and it will allow the Port of Buffalo to accommodate 1,000-foot vessels. As in Alternative IId, the increased efficiency may enable industries with slender competitive advantages to remain profitable where they are now in the Buffalo Harbor.

Combined, the steel and grain industries account for a significant portion of Buffalo's labor force. If this alternative allows enough benefits to Bethlehem, Republic, and Hanna, they may reopen or step up production which could make an important contribution to supporting the area's employment.

Support for existing industry will most likely support existing active land use which automatically works against some major changes in envisioning the area in the near future, e.g., the residential/recreational model in the REVITALIZATION REPORT. The deepening could also allow a more complete utilization of existing facilities. The demolition will free three sites for redevelopment. Although this plan does support continued industrial use generally, future use of the three cleared sites would be up to the city and the clearing would make possible recreational use or land banking (which could enhance terrestrial habitat) as well as industrial use.

As with Alternative IId, clearing the three sites amounts to site preparation which could make the property more valuable and, therefore, more attractive to prospective buyers. If the properties were developed, the tax revenues might be more consistent with waterfront locations as discussed in existing conditions.

Some utility lines in the Buffalo River would be dug up and replaced deeper in the channel bed to allow for increased channel depths and maintain the lines safely. Institutional coordination will be required between the city and the Corps of Engineers for building demolition, with the utility companies for line replacement and with the local cooperator (NFTA) for all aspects of the plan. Any plan would be fully coordinated with the Waterfront Planning Board and appropriate environmental agencies.

The aesthetics of the Inner and Outer Harbor would not be greatly affected. The demolition would remove three "eyesores" and the grading where the bulkheads are removed and the new bulkheading and fenders may slightly improve the visual aspect of the inner harbor. However, this alternative, which contributes to existing land use, will most likely serve to preserve the existing character of the waterfront.

Recreation will not be enhanced in any major way by this plan and it would discourage attempts to reorient the waterfront towards recreational usage. However, the demolition of the three abandoned buildings would free up land which has some potential for recreational use.

As with Alternative IIId, this plan is consistent with expressed local and regional desires for revitalization of the harbor area. Because of this and the support for industry, this alternative could be said to support community and regional growth. By doing this, the alternative could be said to give a slight support to community cohesion as is described in Alternative IIId.

There will be no significant impacts on noise.

(5) Conclusions - Although Plan IIe would provide significant benefits to the grain, sand and steel industries of Buffalo without any major adverse environmental impacts, it is not economically justified with a B/C ratio of 0.90 and net average annual commercial navigation benefits of -\$736,600. It is, therefore, concluded that Plan IIe should be eliminated from further consideration.

LAKEFRONT TRANSSHIPMENT PLANS (IIIIf through-IIIi)

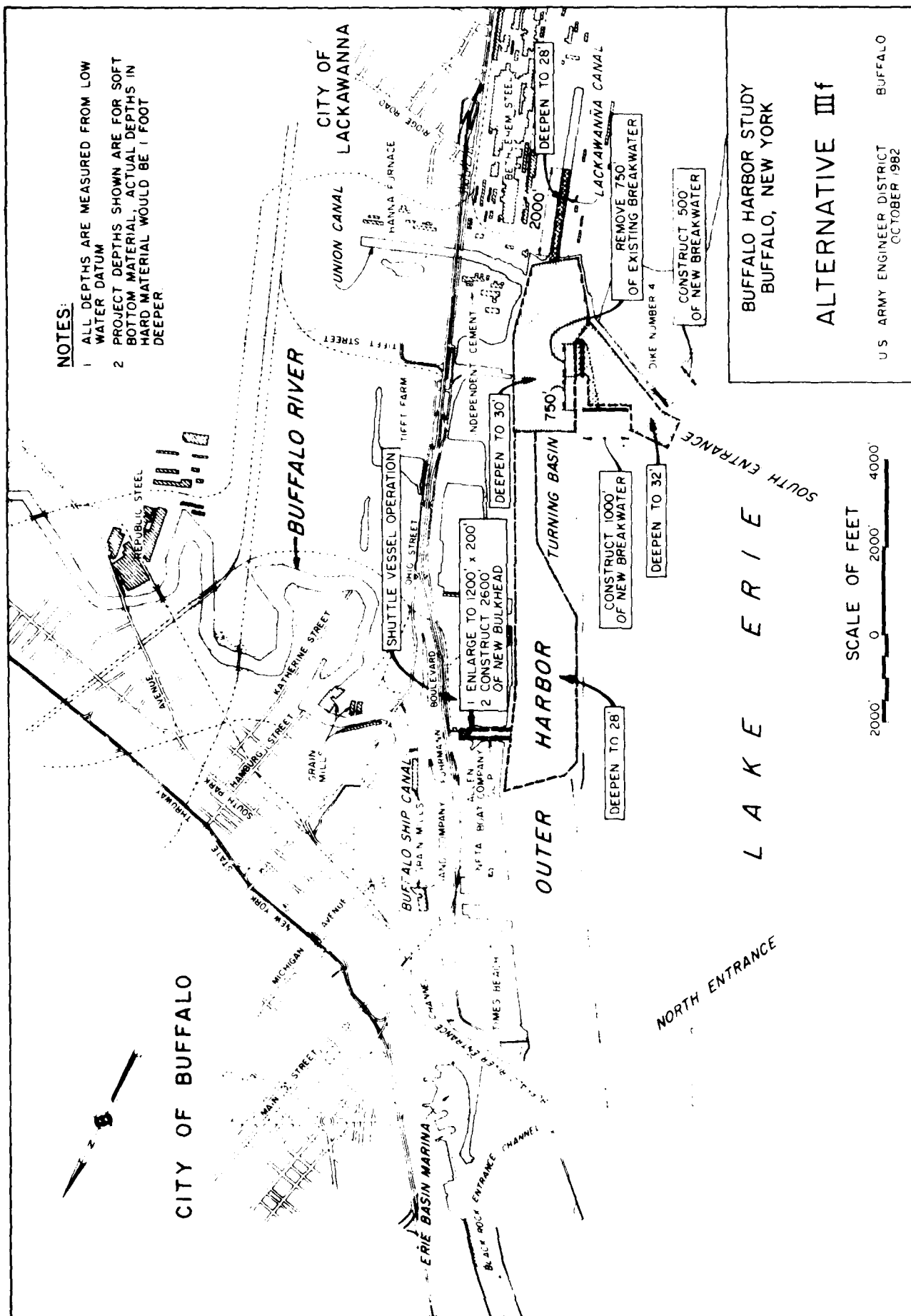
The primary objective of the lakefront transshipment plans developed during Stage 2 planning was to provide for safe and efficient operation of vessels up to 1,000 feet long by 105 feet wide in the Outer Harbor. Any of the plans would also provide deeper entrance channel depths which are required in order for Class V to Class X vessels to safely enter Buffalo's Outer Harbor loaded to the maximum Great Lakes System's draft of 25.5 feet.

As previously discussed under River Deepening Plans, all lakefront transshipment plans were developed based on the assumption that all dredged material is polluted and would be placed in Dike Site 4 which has excess capacity over and above its authorized 10-year life. In addition, due to lack of sufficient environmental data, mitigation plans to compensate for unavoidable negative environmental impacts of the alternatives were not formulated in Stage 2. Mitigation will be evaluated in Stage 3 as appropriate.

Pertinent engineering, economic, environmental and related data for Plans IIIIf, g, h, and i follow:

a. Alternative Plan IIIIf - Shuttle Vessel From NFTA

(1) Description of Plan IIIIf - Plan IIIIf (see Figure 27) consists of the same improvements to the South Entrance Channel as IIe, plus deepening a portion of the Outer Harbor, and the construction of a shuttle vessel transshipment facility on NFTA property. The purpose of this plan is to allow all members of Buffalo's waterfront, steel industry, i.e., Bethlehem Steel, Republic Steel, and Hanna Furnace to safely use, in varying degrees, fully loaded 1,000-foot vessels. Under this plan, Bethlehem would continue to have direct delivery of its raw materials in 1,000-foot vessels, but would be able to safely load them to 25.5 feet. In addition, Republic and Hanna would start using 1,000-foot vessels to deliver iron ore to the Allen Boat Company



slip where it would later be reloaded onto a smaller vessel capable of navigating the shallower waters of the Buffalo River and the Union Ship Canal.

The specific features of this plan are:

(a) Deepen the South Entrance to 32 feet.

(b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No 4.

(c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.

(d) Deepen the southern portion of the Outer Harbor to 30 feet.

(e) Deepen a portion of the Outer Harbor Turning Basin and a portion of the middle Outer Harbor to 28 feet.

(f) Deepen the Allen Boat Company slip to 28 feet, enlarge it to 200 feet by 1,200 feet, and construct 2,600 feet of sheet pile bulkhead.

(g) Employ the services of a smaller shuttle vessel to move iron ore from the Allen Boat Company Slip to Republic Steel and Hanna Furnace.

(2) Cost Estimate for Plan IIIf - The detailed cost estimate for Plan IIIf is presented in Appendix D. Tables 25 and 26, following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IIIf is \$39,185,000 (Table 25) and the total investment cost, including interest during construction, is \$42,529,400 (Table 26). The total annual charges are \$3,347,900.

(3) Economic Evaluation of Plan IIIf - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IIId is presented in Appendix 8, "Economic Evaluation."

All three of the iron ore users: Bethlehem, Republic, and Hanna Furnace would benefit from this plan. Bethlehem Steel would be able to safely fully load the Class X vessels that they use to transport iron ore to their Lackawanna Plant. Republic and Hanna would no longer use Class V and VII vessels, respectively, to move their iron ore from the Upper Great Lakes. Instead, they would employ Class X vessels.

Others who would also benefit from this plan are the bulk commodity vessels which unload at NFTA. Under this plan, they would be able to safely fully utilize the system's 25.5-foot draft. Also, the greater maximum operating draft in

Table 25 - Estimate of Total Project Cost for Alternative Plan IIIf
(June 1982 Price Levels)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
	\$	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
1. Dredging	5,838,200	3,931,500	1,906,700	-	5,838,200
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Bulkheading	9,541,900	-	9,541,900	-	9,541,900
6. Front End Loaders	200,000	-	200,000	-	200,000
7. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	27,093,700	13,614,400	13,479,300	-	27,093,700
8. Contingencies (20 Percent +)	5,506,300	2,785,600	2,720,700	-	5,506,300
Subtotal	32,600,000	16,400,000	16,200,000	-	32,600,000
9. Engineering and Design	3,000,000	1,500,000	1,500,000	-	3,000,000
10. Supervision and Administration	3,400,000	1,700,000	1,700,000	-	3,400,000
Subtotal	39,000,000	19,600,000	19,400,000	-	39,000,000
11. Lands and Damages	185,000	-	185,000	-	185,000
Total Project Cost	39,185,000(1)	19,600,000(1)	19,585,000(1)	-	39,185,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IIIf. Mitigation will be evaluated in Stage 3, as appropriate.

Table 26 - Estimated Investment Cost and Annual Charges for Alternative Plan IIIf
(June 1982 Price Levels)(1)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
	\$	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
Total Investment for Project					
Total Project Cost, Excluding Land	39,000,000	19,600,000	19,400,000	-	39,000,000
Interest During Construction (2)	3,344,400	1,399,100	1,745,300	-	3,344,400
Lands and Damages	185,000	-	185,000	-	185,000
Total Investment, Including Lands	42,529,400	21,199,100	21,330,300	-	42,529,400
Annual Charges for the Project					
Interest	3,242,800	1,616,400	1,626,400	-	3,242,800
Amortization	84,600	42,200	42,400	-	84,600
Additional Maintenance	20,500	20,500	-	-	20,500
Total Annual Charges	3,347,900	1,697,100	1,668,800	-	3,347,900

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .09199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

Outer Harbor as compared to the Buffalo River and Union Canal indicates that in the future, Hanna and Republic may lighter limestone as they now do with iron ore. Therefore, limestone benefits would be applicable to this plan.

Table 27, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IIIf. Net commercial navigation benefits are \$3,183,900 annually and the B/C ratio is 1.95.

Table 27 - Summary of Benefits and Costs for Alternative Plan IIIf (1)

	: Average	: Average	: Net Average	:
	: Annual	: Annual	: Annual	: Benefit/Cost
	: Benefits	: Charges	: Benefits	: Ratio
	: \$: \$: \$:
Total Project	: 6,531,800	: 3,347,900	: 3,183,900	: 1.95
	:	:	:	:

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IIIf - This alternative would require less dredging than Alternative IIe. Dredging would be expected to cause similar impacts to the benthos, fisheries, and water qualities, as previously described (Alternatives IID and IIe), but of smaller magnitude. The adverse impacts would be expected to be temporary and dissipate and return to predredging conditions soon after construction is completed.

The Allen Boat Company slip would be widened and lengthened. This would claim some low valued wildlife habitat and convert it to aquatic habitat. A 2,600-foot sheet pile bulkhead would be installed which would cause some minor erosion during construction and an increase in turbidity as similar to previously described construction compacts for new bulkheading.

Dredging for Alternative IIIf, IIIg, IIIh, IIIi, IVa, and IVb would produce quantities that could all be contained in Dredged Disposal Site 4 in Buffalo (Reference Alternative IID). If sediments are contained in this confined area, impacts to the environment would be deemed minor.

Iron ore would be off loaded from 1,000-foot vessels at the Allen Boat slip. Then smaller shuttle vessels would be reloaded to carry the cargo upriver. This would increase the risk of spillage due to double handling thus causing a greater risk for degradation of water quality in localized areas of loading and unloading.

The major characteristic of this plan is the shuttle system of transporting iron ore from the expanded NFTA facilities at what is now called the Allen Boat slip. As with all of the alternatives, the beneficiaries are harbor industries, in this case, the steel industries alone. The changes in the South Entrance Channel and the Lackawanna Canal will allow safer and fully loaded transits for the 1,000-foot (Class 10) iron ore carriers that service Bethlehem Steel. The Allen Boat slip would be modified to accommodate

the Class 10 vessels which could bring in taconite (iron ore) more cost effectively which benefits Hanna and Republic. This use of the Allen Boat slip enhances use of the Port of Buffalo facilities. The deepening of this portion of the Outer Harbor to accommodate 1,000-foot vessel could attract new users to the harbor.

The proposed shuttle operation would compete with the existing trucking operations which transport materials lightered at NFTA in order to allow vessels to travel up the Buffalo River and Union Ship Canal. Shipping rates are generally lower than trucking rates for bulk commodities, so it could be that an area business would be driven out and some unemployment could result. At the same time a new business would be created and existing or new companies would move to meet the demand. It is also possible that the companies involved would move their own materials.

This alternative supports local employment by supporting local industries as is described in Alternative IId and IIe. Employment could be adversely effected by competition with current trucking operations and beneficially effected by new demands for workers. These effects would not be significant on a region-wide basis.

The modification of the Allen Boat slip could increase the value of the property somewhat and any improvements to the harbor could have a ripple effect on the value of waterfront harbor land. Other than this potential increase in value and the actual physical modifications to the boat slip, land use might be expected to remain generally the same. If a new shuttle business developed, there could be some increase in demand for berths and repair and maintenance space for shuttle vessels.

This plan which supports the existing land use, would work against major shifts toward recreation in the harbor as described under Alternative IIe; but certainly not prevent improvement in recreation within the harbor. Since no abandoned buildings would be removed under this alternative, this land would not be as open to re-use as if the buildings were demolished and the sites prepared. Institutional cooperation would not be required for the buildings but otherwise coordination would remain as described in Alternative IIe.

As mentioned before, vessel safety would be improved. However, the anticipated increase in vessel traffic caused by the shuttle system might slightly increase the risk of accidents although this is not a significant impact. Noise could be slightly increased with any increase in vessel traffic but this effect would be negligible as the harbor is designed for commercial use. Aesthetics would not be significantly impacted. The major visual change would occur at the Allen Boat slip which is NFTA land and not a public site, and there would be a possible increase in air pollution from increased vessel traffic. The effects on community cohesion and growth are the same as those described in Alternative IIe except, perhaps, to lesser degree.

Community services and facilities and tax revenues would not be significantly affected by this alternative.

(5) Conclusions - Plan IIIf provides considerable benefits to the Buffalo Steel industry with no major adverse impacts on the environment. This is also economically justified with a B/C ratio of 1.95 and net average annual benefits of \$3,183,900. For these reasons, it is concluded that Plan IIIf should be carried forward into Stage 3 planning.

b. Alternative IIlg - Rail from NFTA.

(1) Description of Plan IIlg. Plan IIlg (see Figure 28) is the same as IIIf except IIlg employs the services of the railroad to move raw materials inland to Republic Steel and Hanna Furnace instead of a shuttle vessel. This plan assumes that 15 to 20, 100-ton hopper cars would be filled each day and brought to the steel mills.

The specific features of this plan are:

- (a) Deepen the South Entrance to 32 feet.
- (b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.
- (c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.
- (d) Deepen the southern portion of the Outer Harbor to 30 feet.
- (e) Deepen a portion of the Outer Harbor Turning Basin and all of the middle portion of the Outer Harbor to 28 feet.
- (f) Deepen the Allen Boat Company slip to 28 feet, enlarge it to 200 feet by 1,200 feet, and construct 2,600 feet of sheet pile bulkhead.
- (g) Construct 2,000 feet of new track to connect the Allen Boat Company slip with the existing Conrail track on the east side of NFTA.
- (h) Upgrade approximately one-half of existing 14,200 feet of trackage needed to make connections to Republic Steel and Hanna Furnace.

(2) Cost Estimate for Plan IIlg - The detailed cost estimate for Plan IIlg is presented in Appendix D. Tables 28 and 29, following, summarize the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IIlg is \$39,597,000 (Table 28) and the total investment cost, including interest during construction, is \$42,981,800 (Table 29). The total annual charges are \$3,383,300.

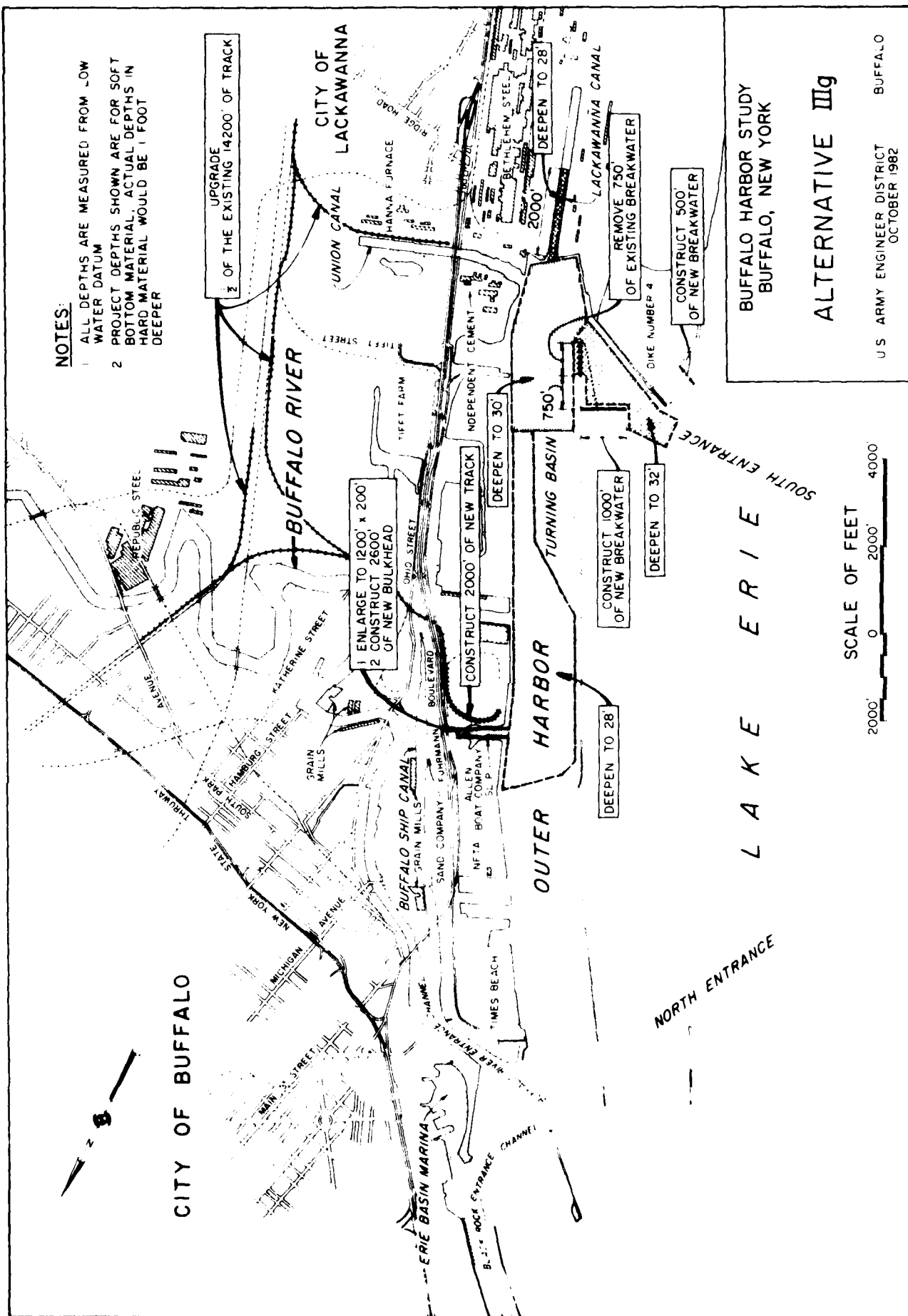


FIGURE 28

Table 28 - Estimate of Total Project Cost for Alternative Plan IIlg
(June 1982 Price Levels)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
1. Dredging	5,838,200	3,931,500	1,906,700	-	5,838,200
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Bulkheading	9,541,900	-	9,541,900	-	9,541,900
6. Railwork	380,700	-	380,700	-	380,700
7. Front End Loaders	200,000	-	200,000	-	200,000
8. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	27,474,400	13,614,400	13,860,000	-	27,474,400
9. Contingencies (20 Percent +)	5,525,600	2,785,600	2,740,000	-	5,525,600
Subtotal	33,000,000	16,400,000	16,600,000	-	33,000,000
9. Engineering and Design	3,000,000	1,500,000	1,500,000	-	3,000,000
10. Supervision and Administration	3,400,000	1,700,000	1,700,000	-	3,400,000
Subtotal	39,400,000	19,600,000	19,800,000	-	39,400,000
11. Lands and Damages	197,000	-	197,000	-	197,000
Total Project Cost	39,597,000(1)	19,600,000(1)	19,997,000(1)	-	39,597,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IIlg. Mitigation will be evaluated in Stage 3, as appropriate.

Table 29 - Estimated Investment Cost and Annual Charges for Alternative Plan IIlg
(June 1982 Price Levels)(1)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
<u>Total Investment for Project</u>					
Total Project Cost, Excluding Land	39,400,000	19,600,000	19,800,000	-	39,400,000
Interest During Construction (2)	3,384,800	1,599,100	1,785,700	-	3,384,800
Lands and Damages	197,000	-	197,000	-	197,000
Total Investment, Including Lands	42,981,800	21,199,100	21,782,700	-	42,981,800
<u>Annual Charges for: the Project</u>					
Interest	3,277,300	1,616,400	1,660,900	-	3,277,300
Amortization	85,500	42,200	43,300	-	85,500
Additional Main- tenance	20,500	20,500	-	-	20,500
Total Annual Charges	3,383,300	1,679,100	1,704,200	-	3,383,300

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

(3) Economic Evaluation of Plan IIIg - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IIIg is presented in Appendix B, "Economic Evaluation."

The harbor users that would benefit from this plan are the same as Plan IIIf.

Table 30, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IIIg. Net commercial navigation benefits are \$3,052,700 annually and the B/C ratio is 1.90.

Table 30 - Summary of Benefits and Costs for Alternative Plan IIIg (1)

	: Average	: Average	: Net Average	:
	: Annual	: Annual	: Annual	: Benefit/Cost
	: Benefits	: Charges	: Benefits	: Ratio
	: \$: \$: \$:
Total Project	: 6,436,000	: 3,383,300	: 3,052,700	: 1.90

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IIIg - Anticipated impacts to physical and biological parameters would be the same as described for Alternative IIIf. Project features are identical except that instead of utilizing a shuttle vessel to transport material up the Buffalo River, a new rail spur would be constructed from the Allen Boat slip over to existing Conrail tracks on the east side of the NFTA property. Additional, upgrading of approximately one-half of the existing rail system in the harbor area would have to take place. This would then allow 100-ton rail hopper cars to be loaded at the slip and then transported daily over land to the steel mills.

The rail construction and upgrading would destroy some low grade terrestrial habitat which would not be expected to cause any significant long-term adverse impacts. The present area is already highly industrialized with a lot of human activity.

The apparent significant aspect of this plan is the transporting of iron ore by rail to Republic and Hanna. These companies and Bethlehem, which would benefit from improvements to the Lackawanna canal and the South Entrance Channel, are the major beneficiaries from this alternative. The NFTA Port of Buffalo would also benefit from increased activity at the Allen Boat slip. The grain industry would not receive any benefits from the rail operation or deepening. As with Alternative IIIf, the deepening of the South Entrance Channel would improve the safety conditions for vessels. The Outer Harbor and Allen Boat slip deepening will allow 1,000-foot vessels to operate at a 25.5-foot draft, thus fully utilizing the Outer Harbor, and increasing the efficiency with which the Port of Buffalo is used. The rail transport would be competing with the existing truck transport in much the same way as is

described for the shuttle in Alternatives IIIf. Conrail would benefit from increased traffic over their lines.

Current employment would be somewhat supported by the support that the project would give industries which are local employers. If truck transport of bulk materials is stopped, some unemployment could occur. Rail shipment may create some employment or would support current Conrail employment.

The rail alternatives have the greatest impact on land use because new track will be laid and rail traffic will be increased. The rail lines run around two sides of the Tifft Farm Nature Preserve and the projected daily runs could be incompatible with the wetland areas the lines run adjacent to. This could have indirect impact on recreation at Tifft Farm. The rail lines could also serve as a barrier to walkers, hikers, and bikers who now use the area, unless adequate provisions are made. Other recreational impacts would be the same as outlined for Alternative IIIf. Effects on property values would be the same as for the previous alternative except that land along the rail line could increase in value if the line could serve any other industries along the way, or property values could decrease where there were incompatible uses. Increased rail activity could bring about increased safety risks due to collisions, derailments or the fact that the lines must cross major roads and popular recreational trails.

Area aesthetics would be altered if rail traffic is heavier than that moving now. The area of the project around Tifft Farm now has had a somewhat "sleepy" character and could develop into an area of brisk activity. It is also probable that noise would increase with increased traffic. Tifft Farm, a community facility, would most likely be negatively impacted by this alternative. Coordination would be much the same as for the other alternatives with the addition of Conrail. Community and regional growth and community cohesion would also be about the same as described under previous alternatives.

Transportation will not be significantly affected by this alternative.

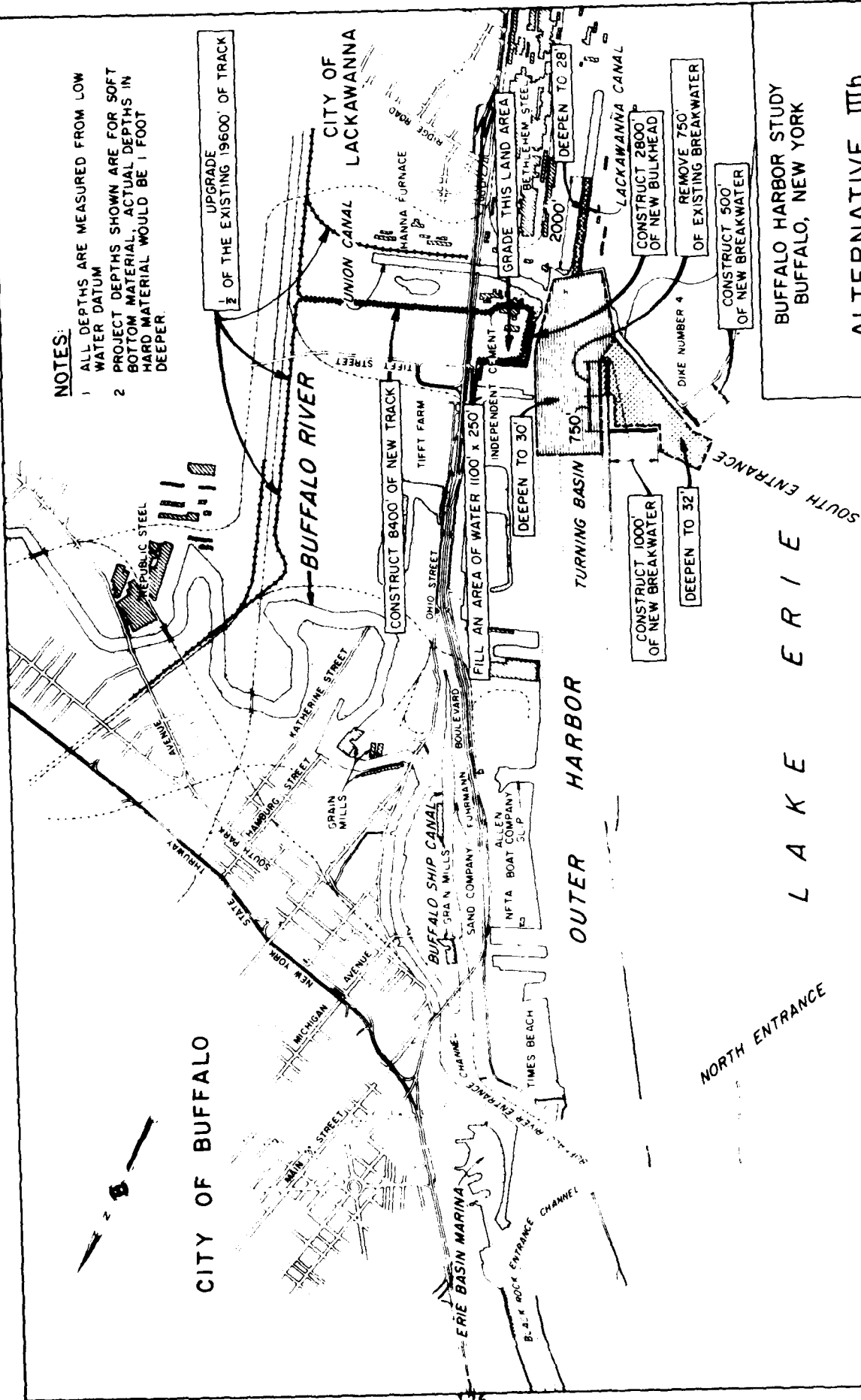
(5) Conclusions - Plan IIIg provides considerable benefits to the Buffalo steel industry with no major adverse impacts on the environment. It is also economically justified with a B/C ratio of 1.90 and net average annual benefits of \$3,052,700. For these reasons, it is concluded that Plan IIIg should be carried forward into Stage 3 planning.

c. Alternative IIIh - Rail from Independent Cement.

(1) Description of IIIh - Plan IIIh (see Figure 29) is basically the same as IIIg except it is constructed in a different area of the harbor. This alternative was formulated in an attempt to try to reduce the overall dredging costs. One of the major construction features of this plan is the filling in of approximately 6-1/2 acres of water area to provide sufficient room for the rail transshipment facility.

NOTES:

- 1 ALL DEPTHS ARE MEASURED FROM LOW WATER DATUM
- 2 PROJECT DEPTHS SHOWN ARE FOR SOFT BOTTOM MATERIAL, ACTUAL DEPTHS IN HARD MATERIAL WOULD BE 1 FOOT DEEPER



SCALE OF FEET
2000' 0 2000' 4000'

BUFFALO HARBOR STUDY
BUFFALO, NEW YORK

ALTERNATIVE IIIh

U.S. ARMY ENGINEER DISTRICT
BUFFALO
OCTOBER 1982

The specific features of this plan are:

- (a) Deepen the South Entrance to 32 feet.
- (b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.
- (c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.
- (d) Deepen the southern portion of the Outer Harbor to 30 feet.
- (e) Fill in an area of water on the north side of the Independent Cement facility that is 250 feet by 1,100 feet.
- (f) Grade a portion of the Independent Cement lands to allow for the placement of iron ore piles.
- (g) Construct 2,800 feet of new sheet pile bulkhead on the west side of Independent Cement to form a new dock.
- (h) Construct 8,400 feet of new track to tie in with the main corridor of Conrail trackage.

(i) Upgrade one-half of the existing 19,600 feet of trackage needed to make the necessary rail connections to Republic Steel and Hanna Furnace.

(2) Cost Estimate for Plan IIIh - The detailed cost estimate for Plan IIIh is presented in Appendix D. Tables 31 and 32, following, summarize the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IIIh is \$40,170,000 (Table 31) and the total investment cost, including interest during construction, is \$43,368,600 (Table 32). The total annual charges are \$3,413,700.

(3) Economic Evaluation of Plan IIIh - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IIIh is presented in Appendix B, "Economic Evaluation."

The benefits associated with this plan are the same as Plan IIIg except that the bulk commodity vessels which unload at NFTA would only be able to use 24.5 feet of their available draft as opposed to 25.5 feet under Plan IIIg.

Table 33, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IIIh. Net commercial navigation benefits are \$2,979,900 annually and the B/C ratio is 1.87.

Table 31 - Estimate of Total Project Cost for Alternative Plan IIih
(June 1982 Price Levels)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
1. Dredging	3,160,400	2,964,800	195,600	-	3,160,400
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Bulkheading	11,621,900	-	11,621,900	-	11,621,900
6. Railwork	1,043,300	-	1,043,300	-	1,043,300
7. Site Develop- ment	452,900	-	452,900	-	452,900
8. Front End Loaders	200,000	-	200,000	-	200,000
9. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	27,992,100	12,647,700	15,344,400	-	27,992,100
9. Contingencies (20 Percent +)	5,607,900	2,552,300	3,055,600	-	5,607,900
Subtotal	33,600,000	15,200,000	18,400,000	-	33,600,000
10. Engineering and Design	3,000,000	1,400,000	1,600,000	-	3,000,000
11. Supervision and Administration	3,500,000	1,600,000	1,900,000	-	3,500,000
Subtotal	40,100,000	18,200,000	21,900,000	-	40,100,000
12. Lands and Damages	70,000	-	70,000	-	70,000
Total Project Cost	40,170,000(1)	18,200,000(1)	21,970,000(1)	-	40,170,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IIih. Mitigation will be evaluated in Stage 3, as appropriate.

Table 32 - Estimated Investment Cost and Annual Charges for Alternative Plan IIih
(June 1982 Price Levels)(1)

Item	Total Project Cost	Traditional Cost Allocation		Proposed Cost Allocation	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	40,100,000	18,200,000	21,900,000	-	40,100,000
Interest During Construction (2)	3,198,600	1,579,200	1,619,400	-	3,198,600
Lands and Damages	70,000	-	70,000	-	70,000
Total Investment, Including Lands	43,368,600	19,779,200	23,589,400	-	43,368,600
Annual Charges for: the Project					
Interest	3,306,900	1,508,200	1,798,700	-	3,306,900
Amortization	86,300	39,400	46,900	-	86,300
Additional Main- tenance	20,500	20,500	-	-	20,500
Total Annual Charges	3,413,700	1,568,100	1,845,600	-	3,413,700

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

Table 33 - Summary of Benefits and Costs for Alternative Plan No. IIIh (1)

	: Average	:	Average	:	Net Average	:
	: Annual	:	Annual	:	Annual	: Benefit/Cost
	: Benefits	:	Charges	:	Benefits	: Ratio
	: \$:	\$:	\$:
Total Project	: 6,393,600	:	3,413,700	:	2,979,900	: 1.87

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IIIh - Impacts of the physical and biological parameters of the harbor would be very similar to those described under Alternative IIlg except that there would be considerably less dredging, therefore, adverse impacts on the aquatic environment, although similar, would be of a smaller degree than the other alternatives requiring dredging.

This plan does require the filling of approximately 6-1/2 acres of potentially significant aquatic habitat for the purpose of pier construction. This pier would be located adjacent to the Independent Cement plant. This construction activity would temporarily drive fish from the embayment and destroy any existing benthos located under the proposed pier site by smothering the organisms. It would be expected that fish should re-enter the area after construction activities subside and the increased turbidity resettles. The new pier would not be conducive to the establishment of improved benthic habitat since it would be smooth steel sheet pile, it would eliminate approximately 6-1/2 acres of aquatic habitat within the littoral zone from use by aquatic organisms.

Approximately, 8,400 feet of new rail track would be constructed and connected to existing lines, and existing track would be upgraded. The new track would traverse low quality terrestrial habitat lying within a highly industrialized and already disturbed area. No significant long-term impacts are anticipated to any biological terrestrial resources of the project area, even with the grading of some minor acreage at the Independent Cement plant.

The impacts of this alternative are very similar to those of Alternative IIIg. The major differences between the two alternatives centers around the concentration of activity in the southern end of the Outer Harbor. The center of transshipment would be transferred from the Allen Boat slip as proposed in IIIg, or from NFTA's current bulk storage area to the area now owned by Independent Cement. This area would be leased from Independent Cement to a new operator. The operator will be determined at a future date. With a smaller portion of the Outer Harbor deepened, shipping in general will be further concentrated into one geographic area. This concentration is not expected to change the impacts of this alternative on business and industry other than mentioned above.

The concentration of rail lines into the Union Ship Canal means that only one side of the Tifft Farm Nature Preserve would be bordered on. This area is currently well utilized by the public for mooring of small boats, boat rentals, fishing and walking and so this alternative may have a negative impact on area recreation through loss of access. The other effect on land use is that a small area on the harbor will be filled and graded to ensure adequate berthing for 1,000-foot vessels. Also, the 8,400 feet of new track will run across some land near the waterfront not used before for rail. All the rest of the new or repaired line will be laid in existing right-of-way.

It is also possible that this concentration and the increased capacity for 1,000-foot vessels could increase the risk of accidents. In other respects, the effects of this alternative are the same as for Alternative IIIg.

(5) Conclusions - Plan IIIh provides considerable benefits to the Buffalo steel industry with no major adverse impacts on the environment. It is also economically justified with a B/C ratio of 1.87 and net average annual benefits of \$2,979,900. For these reasons, it is concluded that Plan IIIh should be carried forward into Stage 3 planning.

d. Alternative Plan IIIi - Shuttle Vessel from Independent Cement.

(1) Description of Plan IIIi - Plan IIIi (see Figure 30) is basically the same as Plan IIIf except it is constructed in a different area of the harbor. It, like Plan IIIh, was formulated in an attempt to try to reduce the overall dredging costs. It also requires the same 6-1/2 acres of water area to be filled in to provide sufficient room for the shuttle vessel operation.

The specific features of this plan are:

- (a) Deepen the South Entrance to 32 feet.
- (b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.
- (c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.
- (d) Deepen the southern portion of the Outer Harbor to 30 feet.
- (e) Fill in an area of water on the north side of the Independent Cement facility that is 250 feet by 1,100 feet.
- (f) Grade a portion of the Independent Cement lands to allow for the placement of iron ore piles.
- (g) Construct 2,800 feet of new sheet pile bulkhead on the west side of Independent Cement to form a new dock.

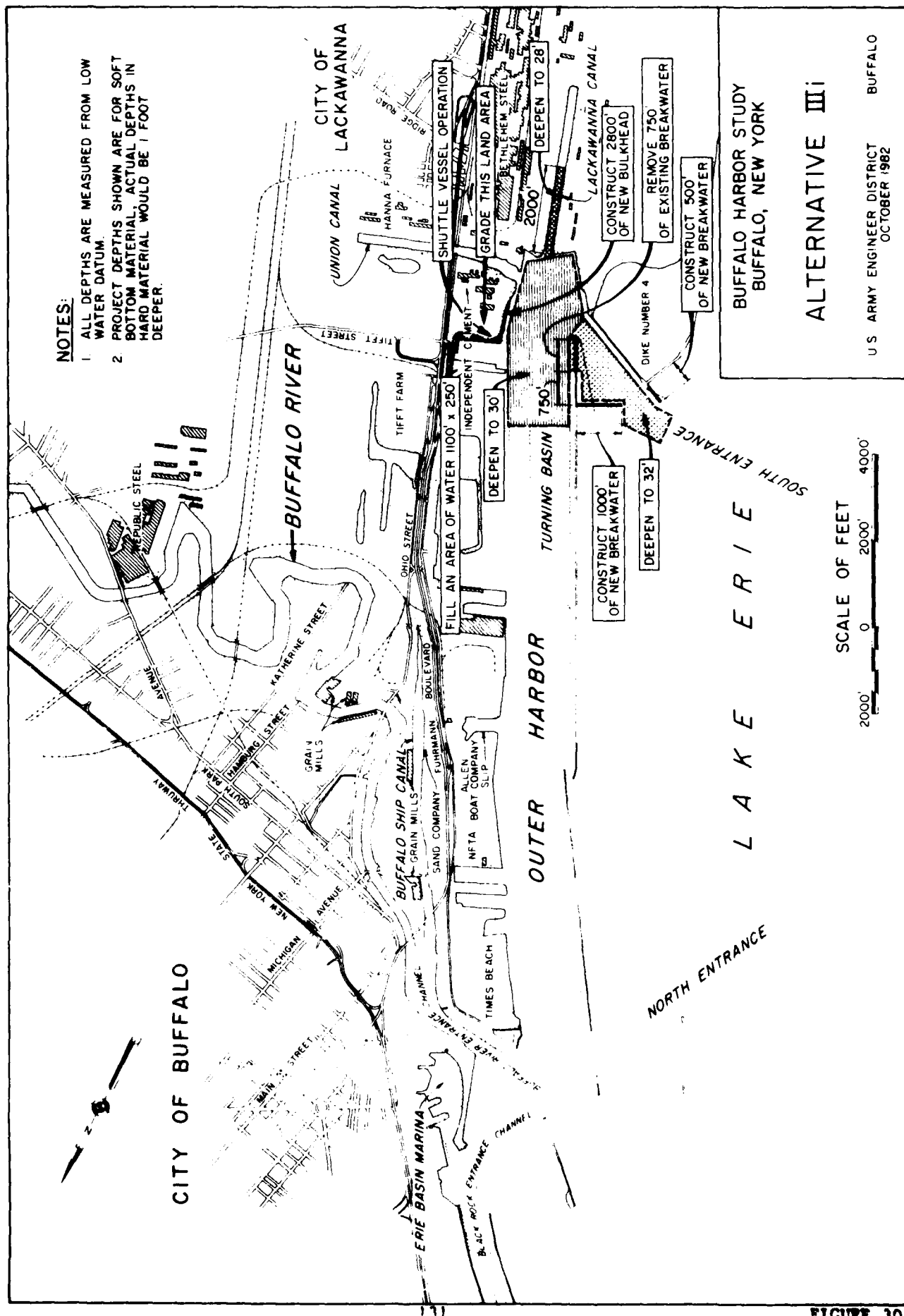


Table 34 - Estimate of Total Project Cost for Alternative Plan IIII
(June 1982 Price Levels)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal
	\$	\$	\$	\$	\$
1. Dredging	3,160,400	2,964,800	195,600	-	3,160,400
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Bulkheading	11,621,900	-	11,621,900	-	11,621,900
6. Site Develop- ment	452,900	-	452,900	-	452,900
7. Front End Loaders	200,000	-	200,000	-	200,000
8. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	26,948,800	12,647,700	14,301,100	-	26,948,800
9. Contingencies (20 Percent +)	5,451,200	2,552,300	2,898,900	-	5,451,200
Subtotal	32,400,000	15,200,000	17,200,000	-	32,400,000
10. Engineering and Design	2,900,000	1,400,000	1,500,000	-	2,900,000
11. Supervision and Administration	3,200,000	1,600,000	1,600,000	-	3,200,000
Subtotal	38,500,000	18,200,000	20,300,000	-	38,500,000
12. Lands and Damages	26,000	-	26,000	-	26,000
Total Project Cost	38,526,000(1)	18,200,000(1)	20,326,000(1)	-	38,526,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IIII. Mitigation will be evaluated in Stage 3, as appropriate.

Table 35 - Estimated Investment Cost and Annual Charges for Alternative Plan IIII
(June 1982 Price Levels)(1)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	38,500,000	18,200,000	20,300,000	-	38,500,000
Interest During Construction (2)	3,087,400	1,611,900	1,475,500	-	3,087,400
Lands and Damages	26,000	-	26,000	-	26,000
Total Investment, Including Lands	41,613,400	19,811,900	21,801,500	-	41,613,400
Annual Charges for: the Project					
Interest	3,173,100	1,510,700	1,662,400	-	3,173,100
Amortization	82,800	39,400	43,400	-	82,800
Additional Main- tenance	20,500	20,500	-	-	20,500
Total Annual Charges	3,276,400	1,570,600	1,705,800	-	3,276,400

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

(2) Cost Estimate for Plan IIIi - The detailed cost estimate for Plan IIIi is presented in Appendix D. Tables 34 and 35, following, summarize the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IIIi is \$38,526,000 (Table 34) and the total investment cost, including interest during construction, is \$41,613,400 (Table 35). The total annual charges are \$3,276,400.

(3) Economic Evaluation of Plan IIIi - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IIIi is presented in Appendix B, "Economic Evaluation."

The harbor users that would benefit from this plan are the same as those for Plan IIIh.

Table 36, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IIIi. Net commercial navigation benefits are \$3,206,500 annually and the B/C ratio is 1.98.

Table 36 - Summary of Benefits and Costs for Alternative Plan IIIi (1)

	: Average	:	Average	:	Net Average	:
	: Annual	:	: Annual	:	: Annual	: Benefit/Cost
	: Benefits	:	: Charges	:	: Benefits	: Ratio
	: \$:	: \$:	: \$:
Total Project	6,482,900	:	3,276,400	:	3,206,500	: 1.98
	:	:	:	:	:	:

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IIIi - Physical and biological impacts would be very similar to Alternative IIIh because the plans are identical except that Alternative IIIi utilizes a shuttle vessel instead of the rail transportation. Therefore, there would be less impact to the terrestrial resources of the project area. No significant long-term biological impacts are anticipated.

The impacts of this alternative are very similar to those of Alternative IIIf. The major differences between the two alternatives again centers around the concentration of shipping activities as at the southern end of the Outer Harbor. The Independent Cement site would become a part of the Port of Buffalo. Although the same industries benefit, shipping activities will be concentrated in the southern end of the harbor and the shuttle operation would pick up its materials at Independent Cement. The risks of accidents would be slightly increased. The Independent Cement location, instead of requiring expansion, would require some fill to adequately berth Class 10 vessels. Other effects remain the same as with Alternative IIIf.

(5) Conclusions - Plan IIIi provides considerable benefits to the Buffalo steel industry with no major adverse impacts on the environment.

It is also economically justified with a B/C ratio of 1.98 and net average annual benefits of \$3,206,500. For these reasons, it is concluded that Plan IIIi should be carried forward into Stage 3 planning.

SOUTH ENTRANCE CHANNEL IMPROVEMENTS

These plans were developed as the minimum plans of improvement to facilitate bulk commodity movements into Buffalo Harbor.

They were developed based on the same assumptions as the River Deepening Plans and the Lakefront Transshipment Plans which were that all dredged material is polluted and would be placed in Dike Site 4 which has excess capacity over and above its authorized 10-year life due to lower than expected volumes from annual maintenance dredging. In addition, due to lack of sufficient environmental data, mitigation plans to compensate for unavoidable negative impacts of the alternatives were not formulated in Stage 2. Mitigation will be evaluated in Stage 3, as appropriate.

Pertinent engineering, economic, environmental and related data for Plans IVa and IVb follows:

a. Alternative Plan IVa - Improvements to the South Entrance Channel and a Portion of the Outer Harbor to NFTA.

(1) Description of Plan IVa - Plan IVa (see Figure 31) consists of improvements to the South Entrance Channel (same as IIe, IIIIf, g, h, and i) and deepening of the middle and southern portions of the Outer Harbor. It is designed to allow the steel industry to safely fully utilize the system's 25.5 feet of available draft.

The specific features of this plan are:

- (a) Deepen the South Entrance to 32 feet.
- (b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.
- (c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.
- (d) Deepen the southern portion of the Outer Harbor to 30 feet.
- (e) Deepen a portion of the Outer Harbor Turning Basin and all of the middle portion of the Outer Harbor to 28 feet.

(2) Cost Estimate for Plan IVa - The detailed cost estimate for Plan IVa is presented in Appendix D. Tables 37 and 38, following, summarize the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method. From these tabulations, it is seen that the total project cost for Plan IVa

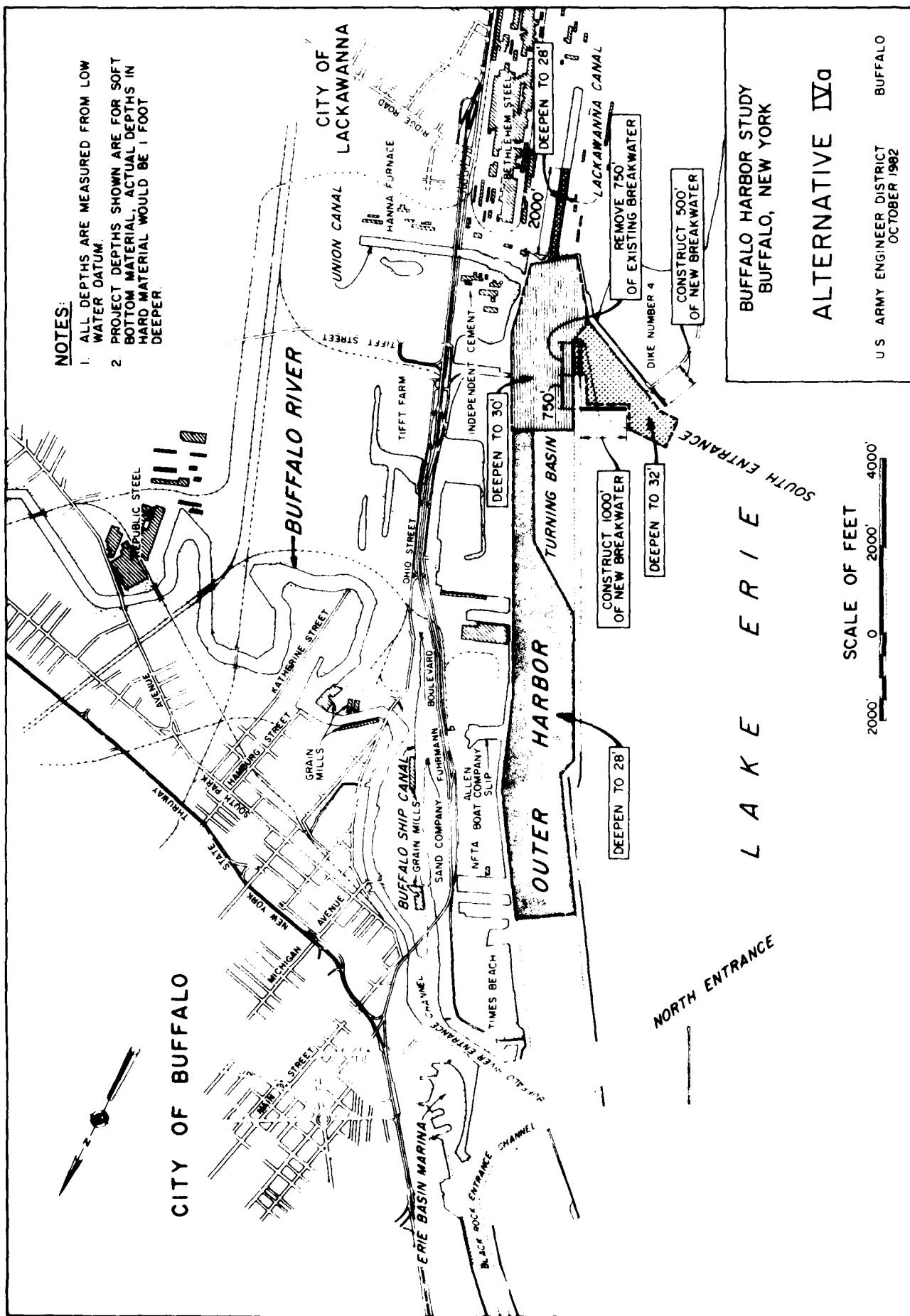


Table 37 - Estimate of Total Project Cost for Alternative Plan IVa
(June 1982 Price Levels)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
1. Dredging	5,832,000	5,636,400	195,600	-	5,382,000
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition					
South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	17,345,600	15,319,300	2,026,300	-	17,345,600
6. Contingencies (20 Percent +)	3,554,400	3,080,700	473,700	-	3,554,400
Subtotal	20,900,000	18,400,000	2,500,000	-	20,900,000
7. Engineering and Design	2,000,000	1,700,000	300,000	-	2,000,000
8. Supervision and Administration	2,000,000	1,700,000	300,000	-	2,000,000
Subtotal	24,900,000	21,800,000	3,100,000	-	24,900,000
9. Lands and Damages	-	-	-	-	-
Total Project Cost	24,900,000(1)	21,800,000(1)	3,100,000(1)	-	24,900,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IVa. Mitigation will be evaluated in Stage 3, as appropriate.

Table 38 - Estimated Investment Cost and Annual Charges for Alternative Plan IVa
(June 1982 Price Levels)(1)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	24,900,000	21,800,000	3,100,000	-	24,900,000
Interest During Construction (2)	2,050,000	1,834,600	150,800	-	2,050,000
Lands and Damages	-	-	-	-	-
Total Investment, Including Lands	26,950,000	23,634,600	3,250,800	-	26,950,000
Annual Charges for the Project					
Interest	2,050,000	1,802,100	247,900	-	2,050,000
Amortization	53,500	47,000	6,500	-	53,500
Additional Maintenance	20,500	20,500	-	-	20,500
Total Annual Charges	2,124,000	1,869,600	254,400	-	2,124,000

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

is \$24,900,000 (Table 37) and the total investment cost, including interest during construction, is \$26,950,000 (Table 38). The total annual charges are \$2,124,000.

(3) Economic Evaluation of Plan IVa - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IVa is presented in Appendix B, "Economic Evaluation."

All three of the iron ore users Bethlehem, Republic, and Hanna Furnace would benefit from this plan. Bethlehem Steel would be able to safely transport iron ore in Class X vessels at a 25.5-foot operating draft. Republic and Hanna would continue their iron ore lightering operation at NFTA using Class V and VII vessels, but they would now be able to bring vessels loaded to 25.5 feet safely to the NFTA dock. The current lightering operation consists of removing a portion of their load, which is later trucked to their mill. This allows them to travel through the more shallow waters of the Buffalo River or the Union Canal to reach their destination.

Others who would benefit from these improvements would be the bulk commodity vessels which unload at NFTA. Under this plan, they would be able to fully use their 25.5-foot draft. Also, the greater maximum operating draft in the Outer Harbor as compared to the Buffalo River and Union Canal indicates that, in the future, Hanna and Republic may lighter limestone as they now do with iron ore. Therefore, limestone benefits would be applicable to the plan.

Table 39, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IVa. Net commercial navigation benefits are \$2,211,800 annually and the B/C ratio is 2.04.

Table 39 - Summary of Benefits and Costs for Alternative Plan IVa (1)

	: Average	:	Average	:	Net Average	:
	: Annual	:	: Annual	:	: Annual	: Benefit/Cost
	: Benefits	:	: Charges	:	: Benefits	: Ratio
	: \$:	: \$:	: \$:
Total Project	: 4,335,800	:	: 2,124,000	:	: 2,211,800	: 2.04

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IVa - Dredging and break-water construction would primarily impact the benthos, fisheries, and water quality of the Outer Harbor and South entrance Channel. Impacts would be very similar to those described for Alternative IIIf except no work would be done in the Allen Boat slip. Adverse impacts would be expected to be temporary and would moderate soon after construction is complete.

These improvements benefit business and industry through the increased ability of the steel mills to use Class 10 vessels. The grain mills and sand

supply house do not benefit from this plan. Less likely than with Plans IIe, IIIIf, IIIg, and IIIh, but still possible, would be the attraction of new shipping into the area with the knowledge that a larger portion of the Outer Harbor meets Federal design specifications for Class 10 vessels. Any support for local employment would be so slight that it could be considered negligible.

Land use will most likely be unaffected. If vessel traffic increases with channel and harbor improvements, the land may be used somewhat more efficiently. Any property value enhancement would be very slight. Safety will be improved by realignment of the South Entrance Channel and much of the Outer Harbor because 1,000-foot vessels move through this area now at some risk as the harbor does not meet Federal design standards for this class vessel.

All other parameters including tax revenues, recreation, community services and facilities, aesthetics, noise, institutional coordination, community cohesion and community and regional growth will not receive any significant impacts.

(5) Conclusions - Plan IVa will assist the Buffalo steel industry with no major adverse impacts on the environment. It is also economically justified with a B/C ratio of 2.04 and net average annual benefits of \$2,211,800. For these reasons, it is concluded that Plan IVa should be carried forward into Stage 3 planning.

b. Alternative IVb - Improvements to the South Entrance Channel Area.

(1) Description of IVb. - Plan IVb (see Figure 32) is the minimum project that would provide benefits to the local steel industry. It consists basically of improvements to the South Entrance Channel (same as all other plans) and deepening the southern portion of the Outer Harbor.

The specific features of this plan are:

(a) Deepen the South Entrance to 32 feet.

(b) Remove 750 feet of breakwater and construct two new sections of breakwater. The first section would be 1,000 feet long and would be constructed perpendicular to the existing breakwater which runs parallel to the Outer Harbor. The second section would be 500 feet long and would extend the length of the breakwater which forms one side of Dike Disposal Area No. 4.

(c) Deepen the first 2,000 feet of the Lackawanna Canal to 28 feet.

(d) Deepen the southern portion of the Outer Harbor to 30 feet.

(2) Cost Estimate for Plan IVb. - The detailed cost estimate for Plan IVb is presented in Appendix D. Tables 40 and 41, following, summarize the Federal and non-Federal share of these costs under both the traditional cost allocation method and the President's new proposed cost allocation method.

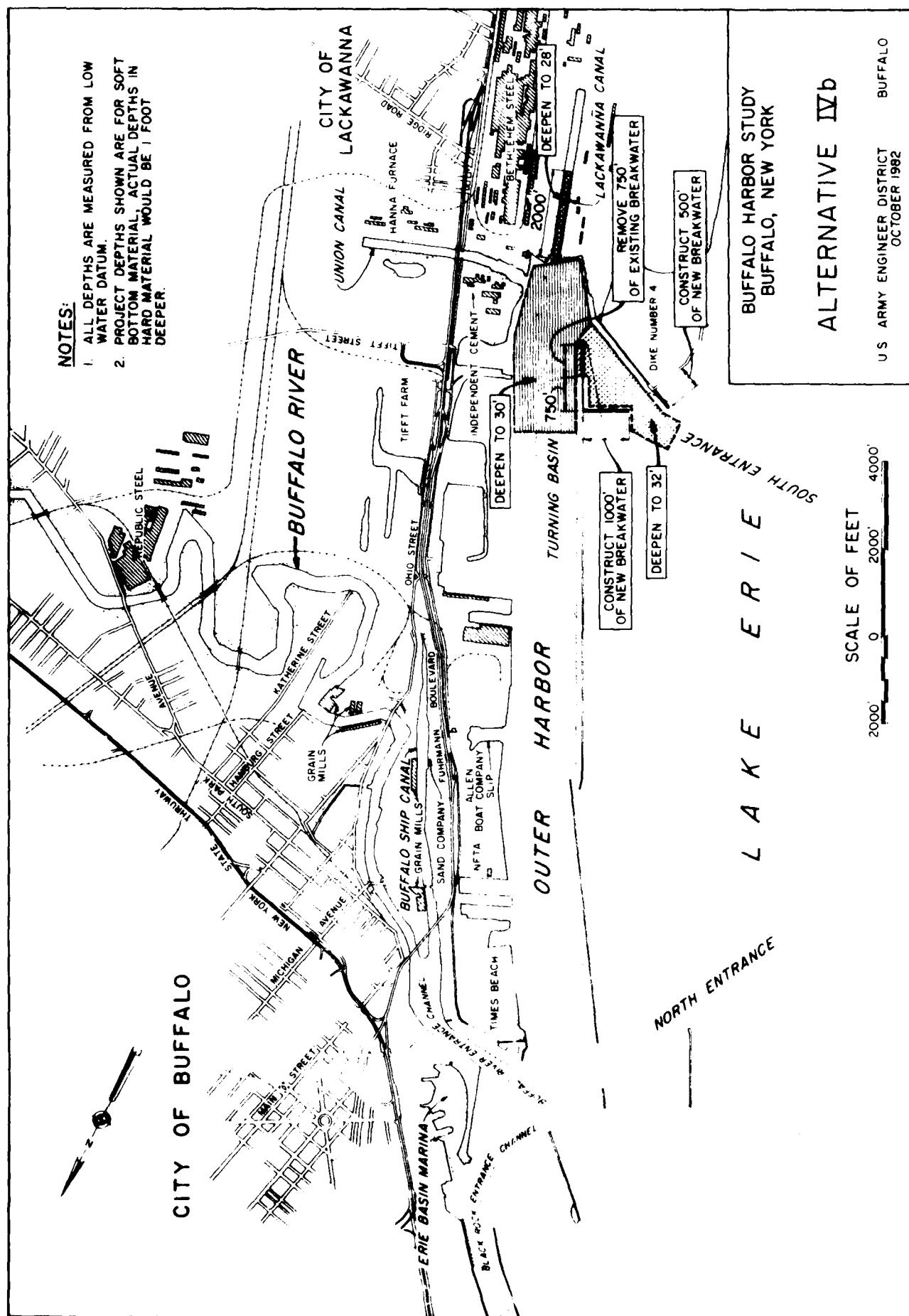


Table 40 - Estimate of Total Project Cost for Alternative Plan IVb
(June 1982 Price Levels)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
1. Dredging	3,160,400	2,964,800	195,600	-	3,160,400
2. Rock Excavation	1,460,700	-	1,460,700	-	1,460,700
3. Demolition					
South Breakwater	1,619,500	1,619,500	-	-	1,619,500
4. New Breakwater	7,693,400	7,693,400	-	-	7,693,400
5. Mobilization and Demobilization	740,000	370,000	370,000	-	740,000
Subtotal	14,674,000	12,674,700	2,026,300	-	14,674,000
6. Contingencies (20 Percent +)	3,026,000	2,552,300	473,700	-	3,026,000
Subtotal	17,700,000	15,200,000	2,500,000	-	17,700,000
7. Engineering and Design	1,700,000	1,400,000	300,000	-	1,700,000
8. Supervision and Administration	1,900,000	1,600,000	300,000	-	1,900,000
Subtotal	21,300,000	18,200,000	3,100,000	-	21,300,000
9. Lands and Damages	-	-	-	-	-
Total Project Cost	21,300,000(1)	18,200,000(1)	3,100,000(1)	-	21,300,000(1)

(1) Does not include costs for mitigation of adverse environmental impacts that may be required for Plan IVb. Mitigation will be evaluated in Stage 3, as appropriate.

Table 41 - Estimated Investment Cost and Annual Charges for Alternative Plan IVb
(June 1982 Price Levels)(1)

Item	Total	Traditional Cost Allocation		Proposed Cost Allocation	
	Project Cost	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	\$	\$	\$	\$	\$
Total Investment for Project					
Total Project Cost, Excluding Land	21,300,000	18,200,000	3,100,000	-	21,300,000
Interest During Construction (2)	1,733,100	1,582,300	150,800	-	1,733,100
Lands and Damages	-	-	-	-	-
Total Investment, Including Lands	23,033,100	19,782,300	3,250,800	-	23,033,100
Annual Charges for the Project					
Interest	1,756,300	1,508,400	247,900	-	1,756,300
Amortization	45,900	39,400	6,500	-	45,900
Additional Maintenance	20,500	20,500	-	-	20,500
Total Annual Charges	1,822,700	1,568,300	254,400	-	1,822,700

(1) 7-5/8 percent interest rate, 50-year life ($i = .07625$, amortization = .00199). Does not include costs for mitigation of adverse environmental impacts.

(2) 2-year construction period.

From these tabulations, it is seen that the total project cost for Plan IVb is \$21,300,000 (Table 40) and the total investment cost, including interest during construction, is \$23,033,100 (Table 41). The total annual charges are \$1,822,700.

(3) Economic Evaluation of Plan IVb - The detailed discussion of the projected commercial navigation benefits that would be realized from implementation of Plan IVb is presented in Appendix B, "Economic Evaluation."

All three of the iron ore users Bethlehem, Republic, and Hanna Furnace would benefit from this plan, but only Bethlehem would be able to receive vessels loaded to a maximum operating draft of 25.5 feet. Republic and Hanna would continue their lightering operation at NFTA using Class V and VII vessels, respectively, but they would only be able to use 24.5 feet of the system's 25.5 feet of draft.

Others who would benefit from these improvements would be the bulk commodity vessels which unload at NFTA but they would only be able to use 24.5 feet of the system's available 25.5 feet of draft. Also, the greater maximum operating draft in the Outer Harbor as compared to the Buffalo River and Union Canal indicates that, in the future, Hanna and Republic may lighter limestone as they now do with iron ore. Therefore, limestone benefits would be applicable to this plan.

Table 42, following, summarizes the annual benefits, annual charges, net benefits, and benefit/cost ratio for Plan IVb. Net commercial navigation benefits are \$2,251,900 annually and the B/C ratio is 2.24.

Table 42 - Summary of Benefits and Costs for Alternative Plan IVb (1)

	: Average	:	Average	:	Net Average	:
	: Annual	:	: Annual	:	: Annual	: Benefit/Cost
	: Benefits	:	: Charges	:	: Benefits	: Ratio
	: \$:	: \$:	: \$:
Total Project	: 4,074,600	:	: 1,822,700	:	: 2,251,900	: 2.24

(1) Based on June 1982 price levels, 7-5/8 percent interest rate and 50-year economic life.

(4) Environmental Features/Assessment of Plan IVb - Impacts to the biological resources as previously described under the other alternatives would be mainly limited to the aquatic resources located in the South Entrance Channel region. This alternative involves dredging the smallest quantities of material when compared to all the alternatives assessed during their stage of planning. Impacts to water quality, benthos, and fisheries would be adverse but expected to be temporary and not significant.

Of the business and industries in the area, only the steel industries would get some benefits from this alternative and only Bethlehem Steel would be able to bring in Class 10 vessels loaded to the system's draft of 25.5 feet.

It is unlikely that new shipping would be drawn by these more modest improvements to the harbor. Safety of entry into the Outer Harbor through the South Entrance Channel would be improved. Other parameters would not be significantly affected by this alternative.

(5) Conclusions - Plan IVb will assist the Buffalo steel industry with no major adverse impacts on the environment. It is also economically justified with a B/C ratio of 2.24 and net average annual benefits of \$2,251,900. For these reasons, it is concluded that Plan IVb should be carried forward into Stage 3 planning.

NO-ACTION ALTERNATIVE

The "No-Action" or do-nothing plan represents the base condition for evaluation of the 8 structural plans previously described. This option, although not favored by the local sponsor and local interests, avoids both the monetary investments and potential adverse impacts associated with the structural improvements. However, bulk cargo movement at Buffalo Harbor would be restricted to smaller and less efficient bulk cargo vessels. Also, because of inadequate channel depth, these vessels would be forced to navigate at less than the maximum Great Lakes System's draft of 25.5 feet. The potential for vessel accidents would also remain high. Problems stated earlier in the report would remain unchanged. The "No-Action" plan would also not meet the planning objectives to provide for economical movement of bulk cargo through Buffalo Harbor.

SUMMARY OF IMPACTS DURING CONSTRUCTION

Construction impacts would occur with all alternatives except the "No-Action Alternative," unless otherwise specified.

a. Natural Environment.

Air Quality - Air quality in the project area would be temporarily affected by dust, noise, odors, and vehicle emissions from the operation of construction equipment. The construction Contractor would be required to follow the Corps latest Civil Works Guide Specifications for Environmental Protection.

Water Quality - Some short-term reversible impacts on water quality would occur during implementation of any of the construction plans associated with the project. The operation of construction and dredging equipment would cause considerable elevations in levels of suspended solids and turbidity, as well as the release of pollutants and/or nutrients associated with the bottom sediments. These impacts would be of relatively high magnitude and short duration, disappearing soon after the construction and/or dredging was completed. Some accidental spillage of fuels, oil, and grease could occur due to the operation of both land-based and marine construction equipment.

Wetlands - The proposed alternatives would not impact on any of the identified wetland areas within the project area.

Vegetation - The highly developed and industrialized nature of Buffalo Harbor has severely altered and limited both the terrestrial and aquatic vegetation patterns within the project area. The proposed alternatives should not cause any significant long-term adverse impacts on vegetation.

Fishery - The fishery of the Buffalo River consists mainly of carp, suckers, bullheads, goldfish, and some forage fish such as shiners with limited spawning habitats available. Proposed alternatives should not cause any significant impacts to these river environments. However, the harbor area shows improvement in species composition with some spawning habitat available. Alternatives would cause some temporary adverse impacts but these should moderate over time with little long-term, adverse effects anticipated to the harbor fishery.

Wildlife - Terrestrial wildlife habitat is limited to a few productive areas within the project limits, none of which are expected to be impacted. The harbor area and some embayments do provide aquatic wildlife habitat that is utilized by waterfowl, quite extensively. The proposed alternatives, however, should not effect the majority of these habitats significantly, therefore not adversely impacting aquatic wildlife to a significant degree.

Endangered Species - No endangered or protected species or habitat critical for their survival should be impacted in a negative manner by any of the proposed alternative plans.

Wild and Scenic Rivers and Prime and Unique Farmlands - No impacts to either of these parameters is anticipated.

Benthos - Benthos populations would be temporarily impacted in an adverse manner. None of the alternatives would be expected to cause any long-term negative impacts to the benthos of the project area.

b. Human Environment.

Aesthetic - The area's aesthetic will be unavoidably altered during construction periods. Although construction impacts are generally considered adverse, construction itself is an attraction for those interested in the processes used to change the human environment. Some view construction as an indicator of economic "life" because of the future it promises. However, the project area is not generally publicly visible. Those most likely to see construction are users of the primarily industrial area and commuters driving over the Father Baker Bridge and Skyway.

Alternative IId and IIe would probably be the most visible because of the North Entrance Channel improvements. Alternative IIe involves the most channel modifications but much of that work (dredging) is carried out under water. The rail Alternatives IIIg and IIIh will affect the largest land areas, because they require laying new, or replacing old, rail and enlarging or filling the two transshipment sites.

Business, Industry and Employment - Construction could temporarily inconvenience area businesses and industries because of increasing land and/or waterborne traffic causing delays, or work around the industries themselves (i.e., replacement of bulkheads).

Any work that is contracted and any procurement of goods and services related to construction of a proposed alternative could benefit regional businesses and industries.

Employment will not be negatively affected by implementing any alternative. It is possible that construction activities could support or stimulate regional employment as the construction schedule is estimated to span a 2- to 3-year period, depending on the scope of the selected plan.

Land Use - Construction generally impacts a larger land area over a short time than the finished product does. Land is needed for staging areas, materials storage and sometimes access roads. Most, if not all of this land, would be returned to its original state after construction is completed, so some ordinary land uses will be disrupted temporarily. Work will probably be done both from onshore and from the water.

Recreation - Water-related recreation in the area would be somewhat affected. Increased turbidity may disrupt area fishing and increased water-borne traffic could inconvenience boaters. With the implementation of the rail alternatives, passive recreation at Tifft Farm Nature Preserve may be disturbed somewhat.

Health and Safety - The disruption caused by construction usually results in slightly higher health and safety risks for construction workers and for those who come into contact with unfamiliar changes (e.g., changes in traffic patterns) in their daily routines.

Community Facilities and Services - Alternatives IId and IIe require relocation of some submerged utility lines. This could cause temporary disruption of services.

Transportation is usually somewhat effected by construction because of increased volumes of traffic and the inconveniences caused by large and fully loaded trucks or slow-moving heavy construction equipment.

Noise is almost always a factor in construction and will undoubtedly increase in the project area if a structural alternative is selected for implementation. As most of the area is industrial, fluctuations in daily noise levels will not create significant impacts. If Alternative IId or IIe is implemented, temporary short-term and sporadic increases in noise levels could carry over into the residential neighborhoods bordering the river. Increased noise levels could also be a nuisance around Times Beach and Tifft Farm.

Other parameters will not be significantly effected by construction activities.

SUMMARY OF FUTURE CONDITIONS

Natural Environment - Federal and State standards for emissions and effluents are becoming more stringent. This fact combined with the recent closing of a variety of industries (e.g., steel milling, grain milling, oil

refining and trucking) in the Buffalo area, is expected to result in improved air and water quality in the near future. This anticipated improved condition in water quality could lead to improvements in the aquatic life present in the Buffalo Harbor area.

Benthic organisms, a lower link in the aquatic food chain, are directly influenced and affected by water quality, and are an important food source for higher organisms. Improved water quality would, therefore, be expected to cause an increase of numbers and species diversity within the benthic community. As a result of this improvement to the benthos, some improvement in the fisheries of the area would be expected. However, the fishery of an area is based on more than just water quality but criteria such as adequate spawning and nursery habitat (e.g., wetlands, aquatic vegetation and gravel beds or shoals).

Since these two parameters are not anticipated to increase significantly and, would remain limited in this highly industrialized and developed area, the future fishery would improve slightly but remain basically similar in composition to current species and numbers.

Undisturbed vegetation is sparse within the project area and most areas within the project area are industrialized or at best urbanized. Even with some industries leaving Buffalo, the cover type - existing vegetation - is not expected to vary significantly from existing condition, since it is not anticipated that either the existing buildings would be torn down and the remaining area planted with vegetation or that existing industries would expand to claim the few remaining vegetated areas.

Urbanization is expected to continue in the project area. The wildlife of an area is influenced by the diversity of habitat types and degree of human disturbance in a given area. Since, undisturbed vegetative areas and wetlands are sparse in the project locale with no significant increase or decrease seen in the future; wildlife should remain relatively constant. In addition, with no additional habitat added in the project zone, it is unlikely that any Endangered Species would be impacted, since any present are viewed by USFWS as transients only.

Human Environment - According to the Principles and Standards, specification of future population conditions should reflect OBERS Series E and E' projections as a basis, unless conditions unique to the study area dictate that OBERS may not be totally satisfactory. Of all OBERS projections, Series E is the most conservative. Table 43 presents four sets of population projections for the Buffalo SMSA and one set for the city of Buffalo. City of Buffalo projections were only available from the ENCRPB and indicate a continued decline, largely because of outmigration from central urban areas.

However, the 1977 Buffalo City Plan states "To a large extent, the future population of Buffalo will depend upon housing available, the condition it is in and the number of people within the Buffalo Metropolitan Area who are attracted to live in the city proper. Experience over the last two decades indicates that population projections based on births and deaths or on

Table 43 - Population Projections, Buffalo SMSA, 1980 - 2040

Source	Area	Year							
		1980	1990	2000	2010	2020	2030	2040	
OBERS Series E	Buffalo SMSA:	1,319,400	1,370,200	1,419,600	1,470,000	1,521,300	1,574,200	1,629,100	
	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	
ENCRPB	Buffalo SMSA:	1,385,700	1,455,100	1,593,100	1,744,300	1,910,000	2,091,500	2,290,200	
	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	
State of New York (1)	City	412,100	382,000	363,900	346,000	346,000	346,000	340,000	
	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	
State of New York (2)	Buffalo SMSA:	1,335,354	1,345,913	1,328,046	1,341,300	1,354,700	1,368,300	1,382,000	
	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	
State of New York (2)	Buffalo SMSA:	1,321,476	1,339,685	1,343,898	1,356,400	1,370,000	1,383,700	1,397,500	
	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	

(1) Set developed through the year 2000 in 1975.

(2) Set developed through the year 2000 in 1977.

NOTE: Projections past the year 2000 based on extrapolations for the previous decade's growth or no growth.

SOURCES: OBERS Series E Projections, Volume 2 and 5, U.S. Water Resources Council (1972); Summary Report on Economic Development in the Erie-Niagara Region, Erie and Niagara Counties Regional Planning Board (1975) and Directory of Planning and Zoning Officials, New York State Economic Development Board, 1977.

advancing age groups bear little relationship to the population characteristics of the city from decade to decade." The plan anticipates the city of Buffalo population to decline, resulting in a more desirable population density given the housing stock and park land.

It is possible that revitalization efforts may encourage the already occurring refurbishing of old urban neighborhoods. High interest rates also discourage home buying. Factors such as these could contribute to stability or reversing the trend toward outmigration from urban area.

The City Plan states further that, "Industrial growth is stretching southeastward from the Buffalo Harbor area, and the town of Lackawanna into the town of Hamburg, and northeasterly from the town of Tonawanda. Significant industrial growth is taking place in an easterly direction from the Buffalo city line through the town of Cheektowaga to the villages of Depew-Lancaster."

In fact, Buffalo is beginning to undergo some amount of revitalization. Neighborhoods such as Allentown, near the CBD, are concrete examples of the trend towards residential and commercial revitalization. Moreover, the light rail rapid transit line and attendant downtown redevelopment efforts represent major steps in upgrading the city's physical and economic health.

Most of the issues surrounding redevelopment of the harborfront area relate to the question of what land uses should be located there. The foremost such issue is how to accommodate both industrial and nonindustrial uses. NFTA (Niagara Frontier Transportation Authority) is the local sponsor for this project and is encouraging industrial and other types of development in their large Outer Harbor land holdings. The ECIDA (Erie County Industrial Development Agency) focuses on retaining existing industries and attracting or expanding desirable industries. The Erie and Niagara County Regional Planning Board (ENCRPB) favors recreational use. The UWAC (Urban Waterfront Advisory Committee) is interested in additional people-oriented developments in the harbor area. Several minimal use or controlled access studies or plans have been developed by such groups as the Sierra Club and the Buffalo Ornithological Society. Although these groups are not planning agencies, they represent an important trend in land use planning.

The groups mentioned above are certainly not the only ones active in the harborfront planning process, but they are the ones that have been most involved in the issues to date.

Currently, there are about 60 projects suggested for construction, expansion, or relocation. The outer harbor lands and those fronting the Buffalo River are the ones most often mentioned. Multiple plans have been proposed for these areas. Some of the proposed uses are compatible and suggest a community planning consensus, but not necessarily for the specific facilities that are proposed for construction, and in some areas, conflicting uses are proposed.

The Buffalo City Plan (1977) affirms the city of Buffalo's commitment to Environmental Quality in the Section E - Special Policies which states: "Should it be determined that a proposal would have a detrimental effect on the environment. The providing policy of this plan to improve or enhance environmental conditions would prevail." The city plan states further "Improvement of the city's lake and river fronts should be made. Public access should be increased..." A continuous park-like character is intended for waterfront development. Integration of uses, whether commercial, industrial, residential or public in nature, is sought. In this sense character is more important than use (p. 17)."

At present, the waterfront area is relatively isolated. Provision of access to the waterfront is essential to proper use of existing areas and to allow for changes that would be produced by redevelopment efforts. Access to the Buffalo River is severely blocked by a band of highways, railways, and industrial development and there is limited access to Times Beach since the closing of the South Michigan Avenue Bridge.

This area is expected to receive increased usage in the future because of the types of facilities located there, including the nature preserve, boat storage and launching facilities, and the lighthouse, which is currently listed on the National Register. Attempts to accommodate increased traffic generated by residential and tourist growth could cause congestion. In addition to problems of traffic flow, access is restricted because most lands along the waterfront are in private hands. Access between existing recreation sites is limited because they are divided by privately-owned lands. The waterfront is a valuable public resource in a large urban area such as Buffalo but it cannot be used satisfactorily unless public access is assured.

The Buffalo River Community Development Corporation in the 1976, District 12 report, cites the following problems for its residential needs; an excessive mixture of land use activities including industrial land use encroachment into residential areas and vice versa, major vacant land areas, obsolete strip commercial development in residential neighborhoods, abandonment of railroad lands and facilities, problems of adaptive reuse of industrial lands and structures.

The report also recommends stabilizing existing residential development, housing rehabilitation, land banking abandoned lands, eliminating residential pockets surrounded by active industrial use, concentrating area retail commercial activity in small neighborhood centers and providing open-space buffers.

National and regional changes and changes within the waterfront area have taken place to such a degree that a fresh perspective is needed on the harbor area and its development possibilities. This fresh perspective could best be achieved through a comprehensive plan that would organize community aspirations into an efficient and resourceful development plan for the waterfront. This work, already underway, is being carried out by the newly created Waterfront Planning Board.

Given the conflicts over best use, the great number of reasonable proposals, and the fact that most of the land is privately owned, it is reasonable to assume that the most likely future for the harbor area (and the one offering the highest possibility of success) is one of mixed use.

Agricultural Plans for local and suburban expansion, and development frequently impact on farmlands and some of the proposals for future land use in the SMSA (Standard Metropolitan Statistical Area) could affect farms in the region. There is some agricultural land on Buffalo Creek in the town of Elma but there are no farms or viable farmlands in the immediate vicinity of the project area. It is highly unlikely that land on or near the waterfront in the project area, with so many different use demands on it, would be used for agriculture in the foreseeable future.

No farms will be displaced by this project.

The last year has seen a further decline in area business and industry with the temporary closing of Republic Steel and Hanna Furnace and the reduction in activity at Bethlehem Steel. Much of the waterfront has been abandoned. The future of such major area industries as steel is dependent on world market decisions and major investment decisions that will be made within the present decade. Other major industries such as grain milling continue in the area because of large capital investments; but the milling industry throughout the United States is responsive to small measures of competitive advantage and is beginning to locate in regions of product distribution. If the national and local economy fails to revive, this trend could continue. However, concerted efforts are underway to support existing and encourage new business and industrial development. Light industry of a nonpolluting and nonwater using type have been proposed as the focus of development efforts.

The greatest unknown factors in the future of the harbor area are community aspirations and political will. There is a tremendous amount of unused land in the harbor area. This land is a valuable asset to the city, and development of some type will most likely take place. The harbor area is already beginning to participate in the overall revitalization effort for the city. The quality and extent of the revitalization effort in the harbor area will be dependent to a great extent on community action, on city and county initiatives, and/or the creation of a revitalization plan.

Continuation of the current trends in the labor force, employment and income would result in higher rates of unemployment, lower overall incomes and buying power and an increase in dependence in public aid. These areas are deeply effected by national policy changes. Local revitalization efforts may stabilize or improve employment, drawing job opportunities into the area. New job opportunities may require some retraining of the existing labor force.

If current housing trends (1970-1980) continue, the Metro areas of the city of Niagara Falls and Buffalo will show a negative growth, and the city and towns surrounding, a larger growth, perhaps influenced by the historic flight to the suburbs. However, revitalization efforts in both major cities may encourage inner-city growth. Also, new construction may be limited by the

relative lack of space, and high interest rates, although several projects are currently underway in the Buffalo Harbor area.

Waterfront Village, nearing completion, contains three high income townhouse complexes. These complexes were developed with the idea of making the waterfront area the showpiece of the city and to draw people into the city or to keep them there. There is some concern that this pattern of development is continuing the trend that was set by earlier developments (i.e., I-190), of blocking access of the inner city and general public from the waterfront.

The city of Buffalo Department of Community Development identified a need for more housing and residential accommodations on the basis of recent studies connected with Waterfront Village. Specific proposals with respect to residential development can be found in the Revitalization Report.

If current trends continue both property values and taxes will continue to rise. Actual tax revenues of the municipalities could be affected by the amount of tax exempt, publicly-owned, underutilized or abandoned waterfront property which does not bring in a proportional amount of revenue. This has been noted in the Buffalo Inner Harbor and could increase as industries close down in the area. If redevelopment plans are successful, tax revenues could increase with more economically advantageous land use in waterfront areas. Those land uses that result in higher tax revenues may not necessarily meet community demands for greenspace, recreation, and shoreline access.

There are no SMSA wide gaps in facilities and services. The water distribution system is in need of repair. Future trends will depend on city and areawide planning.

The development of recreation facilities and opportunities in the study area will depend upon municipal and regional planning. The Waterfront is viewed as a somewhat underutilized or unappropriately designed resource. Planning agencies in both counties have stressed development and enhancement of the waterfront, particularly in relation to tourism. Water related recreation needs as summarized in the Reconnaissance Report (Stage 1) is for facilities that represent a cohesive, interrelated development of the recreation, fisheries, and related environmental quality potential of the waters of the area. Steps towards achieving this have been identified as:

Upgrading and expanding existing parks and facilities to accommodate users in a safe and pleasant manner;

W Tying together and making accessible the focal points for recreating by means such as bikeways, trails, waterborne ferries, public transportation, and private vehicles;

Implementing programs for control of debris, drift and stream bank erosion to improve the aesthetic and environmental quality conditions of the water's edge;

Remedying problems of accessibility to the waterfront in order to realize the maximum use and benefit of waterfront resources (particularly recreation).

Needs and desires in the areas of recreation and environmental enhancement were expressed by all agencies and interest groups, but there was significant disagreement on the amount of space and attention that should be given for these elements. Since the terrestrial habitat within the study area has been limited and degraded to some extent, the existing habitat areas, especially Tifft Farm and Strawberry Island, should be protected, conserved, and enhanced whenever possible. Specific development proposals for recreation can be found in the BUFFALO HARBOR REVITALIZATION STUDY.

In the city of Buffalo, various groups and agencies have been slowly altering the shoreline to be more compatible with recreational use. If SMSA wide policies or the waterfront are developed, this process may be speeded up considerably.

The real determining factor for the future aesthetics of the Buffalo Harbor area and the city as a whole will be the success of the city's revitalization and comprehensive areawide land use plans. Currently, the Waterfront Planning Board is meeting to develop policy and coordinate land use in the waterfront area. Without a comprehensive approach, the waterfront area development will most likely be spotty with individual site owners improving, abandoning, or maintaining their properties. The Drift and Debris Removal Study, if implemented, would contribute to the waterfront area aesthetics.

General noise levels could decrease if the current trend toward loss of population in the urban centers of the SMSA continues. Suburban noise levels could increase but either of these conditions would depend on a variety of factors like population densities, community land uses, etc.

Within the project area, noise levels could decrease if the current trend toward industry leaving the waterfront continues. If revitalization efforts are successful, new development on the waterfront could increase sound levels again. The annoyance caused by these sounds will depend on their character, and residents and workers sense of their propriety. Effects of noise may be reduced by compatible land use and the establishment of buffer zones.

Because of the number, variety, and scope of proposed plans for waterfront land use in the area, it is difficult to foresee what direction harbor development will move in. The formation of the Waterfront Planning Board may provide the central institutional force that can unify the independent decisions being made for the harbor area into a comprehensive master plan.

For community desires, the reader can refer to the SUNYAB Environmental Studies Center's Occasional Paper on "Buffalo Waterfront Revitalization: A Survey of Community Leaders" done for the Sierra Club.

Relative community cohesion in the region is very difficult to predict as it may be affected by fluctuations in employment, the housing market, etc. Project area community cohesion will not likely be significantly effected by

lack of a Federal project. Future development plans could enhance or detract from any one community's cohesiveness. One North American city's expert, Jane Jacobs, expressed concern over the sorting out of different incomes in waterfront housing and the lack of connection of new housing to the rest of the city. Restoration of these kinds of concerns in future planning may contribute to community cohesion in the waterfront area.

Health and safety issues in the region, related to the waterfront, center around the city's water distribution system which is in need of repair, and questions of environmental quality. Solutions to current air and water pollution problems are being studied by industry, groups, and agencies, i.e., BRIC (Buffalo River Improvement Corporation) and USEPA (United States Environmental Protection Agency). Resolution of these problems could make a significant contribution to the area's quality of living.

The implementation of the Drift and Debris Removal Program could eliminate up to 90 percent of the debris in the harbor area, and consequently reduce the navigation hazard to recreational boaters.

Another safety problem is that even though 1,000-foot vessels currently are navigating the South Entrance Channel, the channel does not meet Federal specifications (see Appendix A). The ease of vessel transit may be due in part to high lake levels. If lake levels form their usual pattern and swing low again, there may be some increased risk to vessels navigating through the entrance channel and in the Outer Harbor and River as well.

Once the LRRT is complete, Buffalo will have a complete coordinated regional transportation network. Future plans frequently suggest improving access to the waterfront by changing bus routes, increasing public waterfront sites, connecting public access points by bike/hike trails and others. If areawide redevelopment efforts are coordinated, then transportation to, and around, the waterfront may be improved.

REQUIRED ENVIRONMENTAL COORDINATION

In an effort to protect the quality of the environment, the preparation of this report considered and addressed the applicable statutes and requirements shown in Table 44. Compliance will also be addressed during later stages of planning to ensure complete compliance with Federal, State, and local law at every stage of the study.

Coordination with the U.S. Fish and Wildlife Service (F&WS) and the New York State Department of Environmental Conservation (DEC) has been completed for this stage. The F&WS has provided a technical assistance letter dated 24 August 1982 on the Stage II alternatives and DEC provided a letter dated 19 August 1982 commenting on the same. These and other coordination letters can be found in the Correspondence Appendix of this report.

A complete list of all agencies, organizations, and the interested public that this study has been coordinated with thus far, can be obtained from the Buffalo District, Corps of Engineers.

Table 44 - Compliance With Environmental Protection Statutes for this Stage of the Study

	No-Action Alternative	Alternative IId	Alternative IIe	Alternative IIIf	Alternative IIIg	Alternative IIIfh	Alternative IIIfi	Alternative IIIfj	Alternative IIIfk	Alternative IIIfL
Federal Statutes										
Archaeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
National Historic Preservation Act, as amended, 16 USC 470a, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Fish and Wildlife Coordination Act, as amended, USC 661, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Endangered Species Act, as amended, 16 USC 1531, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Clean Air Act, as amended 42 USC 7401, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 USC 1251, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
National Environment Policy Act, as amended, 42 USC 4321, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Rivers and Harbors Act, 33 USC 401, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Coastal Zone Management Act, as amended, 16 USC 1451, et seq.	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Estuary Protection Act, 16 USC 1221, et seq.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 USC 1401, et seq.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Watershed Protection and Flood Prevention Act, 16 USC 1001, et seq.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Executive Orders, Memoranda, Etc.										
Flood Plain Management (EO 11988)	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Protection of Wetlands (EO 11990)	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Environmental Effects Abroad of Major Federal Actions (EO 12114)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 Aug 76)	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
New York State Freshwater Wetlands Act (wetlands >12.4 acres)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Environmental Conservation Law - Article 15 (Protection of Water)	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full
Local Land Use Plans (See Flood Plain Management EO 11988, also)	N/A	Full	Full	Full	Full	Full	Full	Full	Full	Full

The compliance categories used in this table were assigned based on the following definitions:

- Full Compliance - All requirements of the statute, EO, or other policy and related regulations have been met for this stage of the study.
- Partial Compliance - Some requirements of the statute, EO, or other policy and related regulations, which are normally met by this stage of planning, remain to be set.
- Noncompliance - None of the requirements of the statute, EO, or other policy and related regulations have been met for this stage of planning.
- N/A - The statute, EO, or other policy and related regulations are not applicable for this study.

For a description of these statutes, etc., see Department of the Army, Engineering Regulation No. 200-2-2 "Policy and Procedures for Implementing NEPA."

SECTION V

COMPARISON OF PRELIMINARY PLANS

This section compares the impacts of the 8 preliminary structural plans that an initial screening of alternatives indicated had the greatest potential for meeting the commercial navigation needs of Buffalo Harbor. The basis of comparison for these 8 preliminary plans is the "no-action" (do-nothing) plan. The section also discusses: the rationale for eliminating plans from further consideration; the rationale for selecting preliminary plans for further, detailed study; and the rationale for selection of candidate NED and EQ plans. The section then concludes with a discussion of local views on the future course of the study.

COMPARISON OF PRELIMINARY PLANS

Table 45 compares the impacts of the 8 preliminary structural plans and the "no-action" (do-nothing) plan. Impacts are measured and the results displayed or accounted for in terms of contributions to four accounts: National Economic Development (NED); Environmental Quality (EQ); Regional Economic Development (RED); and Other Social Effects (OSE).

TRADE-OFF ANALYSIS

a. Trade-Off Analysis of Structural vs. Nonstructural Alternatives.

With the exception of the "no-action" plan, the initial screening of alternatives indicated that the greatest potential for meeting the primary planning objectives of promoting the economical movement of bulk cargo at Buffalo Harbor involved structural (as opposed to nonstructural) modifications to existing harbor facilities. Thus, with the exception of the "no-action" plan, no nonstructural plan was carried forward beyond the initial iteration. (NOTE: As previously discussed, an array of nonstructural plans such as rail delivery of iron ore from its source or another Lake Erie port and truck delivery of iron ore from its source were formulated early in Stage 2, but, because of economic and/or technical reasons, they were eliminated from further consideration during the initial Stage 2 screening.)

In terms of trade-offs between the "no-action" and the 8 preliminary structural plans, the "no-action" plan would restrict delivery of bulk cargo at Buffalo Harbor to smaller and less efficient bulk cargo vessels. Further, because of inadequate channel depths, these vessels would be forced to navigate at less than the maximum system's draft of 25.5 feet. Bulk cargo vessels would also continue to be subjected to unsafe conditions on the South Entrance Channel. The "no-action" plan would, however, require no monetary investment and would preclude the potential for conflict with other proposed recreational uses of the harbor. The trade-offs for the 8 structural plans would be the converse of those for the "no-action" plan.

Table 45 - Summary of Effects for Alternative Plans

PLAN DESCRIPTION	Plan IId	Plan IIf	Plan IIg	Plan IIh	Plan IIi	Plan IIj	Plan IIk	Plan IIl	Plan IIm	Plan IIn	Plan IIo
	Deepen the North Entrance Channel, the Buffalo River, and the Buffalo Ship Canal; and the steel, grain, and other items associated with this plan; include the replacement of numerous bulkheads and the removal of some abandoned buildings.	Improve the South Entrance Channel, the Buffalo River, and the Buffalo Ship Canal; and the steel, grain, and other items associated with this plan; include the replacement of numerous bulkheads and the removal of some abandoned buildings.	Construct a shuttle facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a rail transshipment facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a shuttle facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a rail transshipment facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a shuttle facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a rail transshipment facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a shuttle facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a rail transshipment facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.	Construct a shuttle facility on the Buffalo River; include improvements to the South Entrance Channel and deepening of the Buffalo River; also benefit from this plan.
SIGNIFICANT IMPACTS											
1. National Economic Development											
a. Beneficial Impacts:											
(1) Total Annual Benefits	\$2,579,000	\$6,914,800	\$6,531,800	\$6,383,600	\$6,482,900	\$6,435,800	\$6,474,400	\$6,474,400	\$6,474,400	\$6,474,400	\$6,474,400
b. Adverse Impacts											
(1) Total Investment Costs	\$49,780,470	\$49,041,700	\$21,199,100	\$19,779,200	\$19,811,900	\$23,634,600	\$19,782,300	\$19,782,300	\$19,782,300	\$19,782,300	\$19,782,300
(a) Federal	\$1,361,200	\$1,361,200	\$21,330,300	\$23,589,400	\$21,801,500	\$3,250,800	\$3,250,800	\$3,250,800	\$3,250,800	\$3,250,800	\$3,250,800
(b) Non-Federal	\$48,419,270	\$47,680,500	\$2,868,800	\$4,199,800	\$4,010,400	\$20,388,800	\$16,531,500	\$16,531,500	\$16,531,500	\$16,531,500	\$16,531,500
(2) Annual Charges - Traditional Cost	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000
(a) Federal	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000	\$7,503,000
(b) Non-Federal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(3) Total Investment Cost - Proposed Cost Allocation (1)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(a) Federal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(b) Non-Federal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(4) Annual Charges - Proposed Cost Allocation (2)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(a) Federal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
(b) Non-Federal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
c. Economic Efficiency:											
(1) Net Annual Benefits	\$4,924,000	\$9,716,600	\$3,183,900	\$2,979,900	\$3,206,500	\$2,211,800	\$2,251,900	\$2,251,900	\$2,251,900	\$2,251,900	\$2,251,900
(2) B/C Ratio	0.34	0.90	1.95	1.87	1.98	2.04	2.24	2.24	2.24	2.24	2.24

[illegible]

Plan 1Id	Plan 1Ie	Plan 1Ilg	Plan 1Ihh	Plan 1III	Plan 1Iv	Plan 1Vb	No-Action (No-Nothing)

[illegible]

Table 4-5 - Summary of Effects for Alternative Plans (Cont'd)

[illegible]

(1) Based on June 1992 price level. Includes lands, damages and interest during construction.

(2) Based on June 1994 price levels, 7-5/8 percent interest rate, and 50-year economic life.

b. Trade-Off Analysis of Structural Plans. Of the eight preliminary structural plans, two plans (IIId and IIe) call for deepening of the Buffalo River and Buffalo Ship Canal. Four plans involve transshipment of bulk commodities upriver from the Outer Harbor via rail or shuttle vessel and two plans concentrate on improvements in the area of the South Entrance Channel.

In devising the alternative plans, primary consideration was given to economic considerations, vessel safety considerations, potential adverse environmental impacts and the effects on wave activity in the Lakefront Harbor. From investigations performed as part of this Stage 2 study, there appears to be no serious adverse environmental impacts from any of the alternatives formulated. In addition, for the Outer Harbor modification plans, additional structural modifications were added to the plans, where necessary, to ensure that wave activity in the Outer Harbor did not increase above existing conditions. Therefore, the overriding considerations used to determine which alternatives would be carried forward into Stage 3 planning are economic efficiency and vessel safety.

RATIONALE FOR PLANS ELIMINATED FROM FURTHER DETAILED STUDY

As stated in the Trade-Off Analysis section above, the overriding considerations in choosing which alternatives warrant further study and which alternatives should be eliminated from further consideration are economic efficiency and vessel safety.

a. River Deepening Plans. Both river deepening plans IIId and IIe failed to meet the minimum economic criteria (i.e., $B/C \geq 1$). Plan IIId had a B/C ratio of only .34. In comparison to Plan IIId, Plan IIe was a stronger plan with a B/C ratio of .90. Since Plan IIe is so close to meeting the minimum economic criteria, the argument could be made that maybe through a little optimization this plan could become economically justified since it is the only plan felt which assists the grain industry. Anticipating this query, the Buffalo District reexamined Plan IIe.

Plan IIe is the same as Plan IVa, except it has an increment added to benefit the grain industry and Founder's Sand Products. A quick review of the previous section of this report shows that Alternative IVa is economically justified with a B/C ratio of 2.04, yet when the grain increment is added on the B/C ratio drops to .90. This can only mean one thing; the grain sand increment is not economically justified. This was confirmed by a quick estimate of the costs and benefits associated with the increment. Even when the project draft was reduced by 1 foot from 22.5 to 21.5 in an attempt to optimize the costs and benefits, this increment was not economically justified. Hence, the Buffalo District feels confident that Plan IIe is not worth pursuing any further.

RATIONALE FOR PLANS WARRANTING FURTHER DETAILED STUDY

a. Transshipment Plans. Plans IIIIf, IIIIg, IIIIh and IIIIi all have exceeded this minimum economic criteria. Their benefit to cost ratios range from 1.87 to 1.98.

b. South Entrance Channel Improvements. Plans IVa and IVb both are economically justified with B/C ratios of 2.04 and 2.24 respectively.

c. "No-Action" Plan. As with any potential water resources project, the "no-action" or do-nothing plan is carried forward as an alternative course of action in the event that more detailed studies show structural and/or nonstructural plans can not be implemented because of the absence of engineering, economic, environmental, financial, social, or political viability. Therefore, the "no-action" will be considered further, and will be used as the basis-of-comparison in evaluating the structural plans that warrant further, detailed study.

RATIONALE FOR CANDIDATE NED PLAN(S) AND EQ PLAN(S)

In selecting the candidate National Economic Development (NED) Plan(s), candidate plans must not only satisfy the planning objectives and evaluation criteria, they must also maximize net benefits. The plan that best fulfills these criteria is Alternative Plan IIIi, the shuttle vessel transshipment system from Independent Cement, with net average annual benefits of \$3,206,500. However, it should be understood that, since Plan IIIi involves the filling of approximately 6-1/2 acres of water area, Stage 3 environmental investigations may recommend substantial mitigation measures which could result in a different plan being recommended as the NED plan due to the lowering of the net average annual benefits of Plan IIIi.

Recognizing that environmental quality has both natural and human manifestations, the EQ Plan addresses the planning objectives in a way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring or enhancing the significant cultural and natural environmental attributes of the study area. Developing an EQ Plan involves combining study specific measures together which best address the EQ Objectives developed for the study, while, if possible, meeting other study objectives. EQ Plans should not have adverse impacts which override their positive preservation and enhancement features. This means that candidate EQ Plans must make net positive contributions to the components of the EQ account.

Based on this Stage 2 investigation, the results indicate that no plan made a net positive contribution to the aforementioned attributes considered in the EQ designation. Therefore, no plan was designated. However, a Least Environmental Damaging Plan was identified - Plan IVb. It is anticipated that this plan would cause the least damage to the existing environment of the Buffalo Harbor area.

LOCAL RESPONSE TO STAGE 2 EVALUATION OF ALTERNATIVES

On 14 July 1982, the Buffalo District held a workshop with the commercial harbor users. Then on 16 September 1982, the Buffalo District held a workshop with the general public in the auditorium of the main branch of the Buffalo and Erie County Public Library. The purpose of both meetings was to show everyone the process that was used to get to the eight alternatives that

were evaluated in Stage 2 and to obtain their input before the final Stage 2 recommendations were made.

During these meetings support was given to Plans IIIg; provided the rail spur was moved further to the north in Stage 3; IIIh, and IIIi. Additionally, although there were a number of questions regarding the overall procedure for evaluating the alternatives, there were no major objections to what had been done to date.

SECTION VI

CONCLUSIONS

COMMERCIAL NAVIGATION

The conclusion of this report is that six of the eight structural commercial navigation alternatives that were identified for a complete Stage 2 analysis should be carried forward into Stage 3 Study. These are:

a. Transshipment Plans

Alternative Plan IIIf - Shuttle vessel from NFTA

Alternative Plan IIIg - Rail from NFTA

Alternative Plan IIIh - Rail from Independent Cement

Alternative Plan IIIi - Shuttle vessel from Independent Cement

b. South Entrance Channel Improvements

Alternative Plan IVa - Improve the South Entrance Channel and deepen the middle and southern portions of the Outer Harbor.

Alternative Plan IVb - Improve the South Entrance Channel and deepen the southern portion of the Outer Harbor.

It is also concluded that further investigations of river deepening concepts is not warranted since the two best plans identified under this category of improvement are not economically feasible.

RECREATION

Based on a further analysis of the four recreational measures that were identified by the supplementary Revitalization Study, this report concludes the following:

a. Creation of Offshore Islands - Locals may wish to pursue this concept further, but based on a very preliminary evaluation this concept does not appear to be feasible and as such should not be carried forward into Stage 3 study.

b. Expansion of the NFTA Small-Boat Harbor - This may best be addressed under Section 107 of the Rivers and Harbors Act of 1960. The Buffalo District has already taken steps to initiate this work at the request of the NFTA.

c. Recreational Boating Demand Analysis - Additional work needs to be done in Stage 3 to complete this effort.

d. Drift and Debris Removal. Based on the preliminary evaluation that was done during stage 2, it is concluded that Alternative III, which calls for a one-time cleanup program to rid the harbor of the major structural sources of drift should be carried forward into Stage 3 study.

OTHER

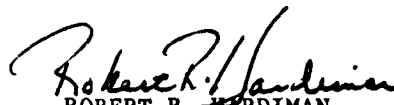
It will be necessary to completely revise the Buffalo Harbor study schedule for Stage 3, due to the recent expansion of the study area and the request by locals to realign the study schedule.

One item that has already been identified for consideration within the new study area is the fishing access problem associated with the Bird Island Pier. The Bird Island Pier is a stone-filled timber crib structure which was built between 1822-1834 to form the outer wall of the Black Rock Channel. Over the years, this has become a very popular place for fishing. Unfortunately, due to the design of the pier which allows water to flow across its crest during high water levels, a number of fishermen drown every year by being washed off the pier due to a sudden rise in the water level. Attempts have been made in the past to either block access or solve the problem; both have failed. Therefore, since locals are once again requesting a reexamination of this problem, it is concluded that it should be considered during Stage 3 of the Buffalo Harbor Study.

SECTION VII

RECOMMENDATIONS

I recommend that the District proceed with a Stage 3 level investigation and prepare a Final Feasibility Report for the Buffalo Harbor Study.



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District Engineer

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For further references on the Buffalo SMSA (Erie and Niagara Counties), refer to the various bibliographies in the Drift and Debris Removal Appendix to this report. Also see the subject bibliographies in the Reconnaissance Report for Buffalo Harbor and the Document List in the Buffalo Harbor Revitalization Study cited above.

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